ATTACHMENT (A)

WAC-23/052 (08.22.2022)

UNITED STATES OF AMERICA

DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda Item 1.6

1.6 *to consider, in accordance with Resolution **772 (WRC-19)**, regulatory provisions to facilitate radiocommunications for sub-orbital vehicles;*

Stations on board sub-orbital vehicles have a need for voice/data communications, navigation, surveillance, and telemetry and tracking and command (TT&C) applications to safely and effectively complete various mission requirements

BACKGROUND INFORMATION:

WRC-19 recognized that stations on board sub-orbital vehicles may use systems operating under space and/or terrestrial services, and that the current regulatory provisions and procedures for terrestrial and space services may not be adequate for international use of relevant frequency assignments by stations on board suborbital vehicles. Some inconsistencies were raised during the preparations for WRC-23 agenda item 1.6, between the operational use of stations on-board suborbital vehicles, and the definitions of *terrestrial stations* in RR No **1.62**, *earth stations* in RR No **1.63**, and *space stations* in RR No **1.64**. Radio stations operating on-board suborbital vehicles are currently, and expected in the future, to operate both in frequency bands currently allocated for terrestrial radiocommunication services, and those allocated for space radiocommunication services. While in the RRs, each station shall be classified by the service in which it operates permanently or temporarily (RR No. **1.61)**, the suborbital vehicle may be physically located within the major portion of Earth's atmosphere or beyond for a brief period of time, but the physical location of the suborbital vehicle on which the stations are located does not necessarily change the need for, or purpose of, the use of specific radiocommunication services.

In accordance with RR No. **1.64,** there are no difficulties with the existing RR Article 5 allocations when a *space station* on-board suborbital vehicle goes beyond or is intended to go beyond a major portion of the Earth's atmosphere, based on the space radiocommunication service in which the station operates. This proposal considers that terrestrial and Earth stations onboard the suborbital vehicle do not become a *space station* but are considered terrestrial stations or Earth stations for the entire flight.

A *terrestrial station* is defined as, "a station effecting *terrestrial radiocommunication,*" and *terrestrial radiocommunication* (RR No. **1.7**) is defined as, "any radiocommunication other than *space radiocommunication* or *radio astronomy*". Under RR No. **1.61**, each station shall be classified by the service in which it operates permanently or temporarily. While the suborbital vehicle is physically located beyond the major portion of the Earth's atmosphere for a brief period of time, the physical location of the suborbital vehicle on which the stations are located does not change the need for, or purpose of the use of specific radiocommunication applications.

One objective of *Resolution **772 (WRC-19)*** is to facilitate radiocommunications necessary to safely integrate suborbital vehicles into the same airspace as conventional aircraft during their transition to and from space in order to minimize the airspace disruption. Studies found in Report ITU-R M.2477 show that suborbital vehicle activity requires making unavailable large areas of international and national airspace. This results in airspace disruptions, extra travel time, re-routing flight paths, and additional aircraft fuel consumption. The report shows the feasibility of using existing aircraft avionics systems by suborbital vehicles without modification of the existing Article 5 RR provisions. A WRC Resolution is proposed to clarify the use and classification of stations necessary for the safe and efficient operation of suborbital vehicles.

Proposal

ADD USA/A1.6/1

RESOLUTION [SOV] (WRC-23)

Use of and Classification of Stations On-board Suborbital Vehicles

The World Radiocommunication Conference (Dubai, 2023),

Considering

a) that sub-orbital vehicles operate at higher altitudes than conventional aircraft, with a sub-orbital trajectory;

b) that sub-orbital vehicles operate through the lower levels of the atmosphere, where they may operate in the same airspace as conventional aircraft;

c) that sub-orbital vehicles may perform various missions such as conducting scientific research or providing transportation;

d) that stations on board sub-orbital vehicles are to accommodate all or some of the following applications: voice/data communications, navigation, surveillance, and telemetry,

tracking and command (TT&C), and may use systems operating in the Aeronautical Radionavigation Service (ARNS); Aeronautical Mobile (Route) Service (AM(R)S); Mobile Satellite Service (MSS); Radionavigation Satellite Service (RNSS); and, Aeronautical Mobile Satellite (Route) Service (AMS(R)S);;

e) that sub-orbital vehicles must be safely integrated into airspace used by conventional aircraft;

f) that some stations onboard sub-orbital vehicles may need to communicate with air traffic management systems and relevant ground control facilities;

h) that some orbital satellite launch rocket systems or components may be considered as a sub-orbital vehicles;

recognizing

a) that some sub-orbital flights could reach altitudes for a brief period of time in space without sufficient energy to sustain permanent orbit;

b) that there is no internationally agreed legal demarcation between the Earth's atmosphere and the space domain;

c) that stations on-board sub-orbital vehicles may use systems operating under space or terrestrial services;

d) that Annex 10 to the Convention on International Civil Aviation contains Standards and Recommended Practices (SARPs) for aeronautical radionavigation and radiocommunication systems used by international civil aviation;

noting

a) that Report ITU-R M.2477 defines sub-orbital flight as an intentional flight of a vehicle expected to reach the upper atmosphere with a portion of its flight path that may occur in space without completing a full orbit around the Earth before returning back to the surface of the Earth;

b) that Report ITU-R M.2477 defines a sub-orbital vehicle as a vehicle executing sub-orbital flight;

c) that Report ITU-RM.2477 provides information on radiocommunications for sub-orbital vehicles, including a description of the flight trajectory, categories of sub-orbital vehicles, technical studies related to possible avionics systems used by sub-orbital vehicles, and service allocations of those systems;

e) that the provisions of No. **4.10** may apply to certain aspects of sub-orbital vehicle operations;

f) that the development of compatibility criteria between International Civil Aviation Organization (ICAO) standardized aeronautical systems is the responsibility of ICAO;

resolves

1 that stations on-board suborbital vehicles may be terrestrial stations (RR No. 1.62) or earth stations (RR No. 1.63), or both, and those stations are used in all phases of flight, without change to classification, within their respective service allocations..

2 that the stations on board sub-orbital vehicles shall not create new constraints on applications of the same service and on other radiocommunication services that are allocated on a primary basis in the same and adjacent frequency bands,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

invites the International Civil Aviation Organization

to take into account this Resolution and relevant portions of Report ITU-R M.2477 in the course of developing SARPs for ICAO systems that may be used by sub-orbital vehicles.

Reasons: This action will clarify that stations on-board sub-orbital vehicles may terrestrial stations (RR No. **1.62**) and earth stations (RR No. **1.63**) and can be used in all phases of flight, within their respective service allocations. The stations shall not impose any new constraints on applications of the same service and other radiocommunication services that are allocated on a primary basis.

SUP USA/A1.6/2

RESOLUTION 772 (WRC-19)
Consideration of regulatory provisions to facilitate the introduction of sub orbital vehicles

Reasons: This resolution may be suppressed by WRC-23 because of a decision to add a new WRC Resolution clarifying the use of frequencies on-board suborbital vehicles.

WAC-23/053 (08.22.2022)

UNITED STATES OF AMERICA

DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

AGENDA ITEM 1.7: *Studies on a possible new allocation to the aeronautical mobile-satellite (R) service within the frequency band 117.975-137 MHz in order to support aeronautical VHF communications in the Earth-to-space and space-to-Earth directions (WRC-19)*

BACKGROUND INFORMATION:

The frequency band 117.975 - 137 MHz is allocated on a primary basis to the AM(R)S service and used for air-ground, ground-air and air-air systems, providing critical voice and data terrestrial communications for air traffic management and airline operational control on a global basis. Resolution **428 (WRC-19)** invites WRC-23 to consider a new primary allocation to the AMS(R)S based on the results of sharing and compatibility studies. This new AMS(R)S service is intended to support direct pilot-air traffic controller voice as well as data communications in oceanic and remote areas without modifying aircraft equipment.

The AM(R)S allocation in 117.975-137 MHz supports Air Traffic Control (ATC) and Aeronautical Operational Control (AOC) systems for aircraft. This includes both standard voice communications and datalink systems utilizing data messages for ATC and AOC functions to aircraft in the air and on the ground. There is significant utilization by terrestrial VHF systems within this allocation today, thus severely limiting options for new regional or national satellite frequency assignments that would need to be harmonized with existing terrestrial assignments.

Many administrations use ICAO regional groups to plan and register cross border assignments in the 117.975-137 MHz frequency band. However, not all administrations participate in this process, and even those that do may only include ATC voice but not either AOC or applicable AM(OR)S assignments. For example, several administrations within ITU-R Region 2 coordinate cross border AM(R)S assignments directly through mutual bilateral agreements but do not participate in any ICAO process for recording any AM(R)S assignments.

The current draft ITU-R studies carried out under Resolution **428 (WRC-19)** indicate support for a new primary AMS(R)S service in the 117.975 – 136 MHz frequency band provided such an allocation is found to be compatible with existing services and implemented with an appropriate means of planning and coordination. The new allocation must protect existing primary services in and adjacent to the frequency band 117.975-137 MHz and should not constrain the planned usage of those systems.

PROPOSAL

Support a new primary AMS(R)S allocation in the 117.975 – 136 MHz frequency band, under Resolution **428 (WRC-19),** subject to agreement obtained under No. **9.21** and limited to relaying voice-only aeronautical air traffic control communications that operate and are planned in accordance with recognized international aeronautical standards. Such use shall not cause harmful interference to, nor

claim protection from, current and future AM(R)S systems operating in the frequency range 117.975-137 MHz.

By limiting to ATC voice systems only, any planning required for States that are not formally part of the ICAO process could be managed through CAAs on a case-by-case basis directly with ICAO. Further studies before WRC-23 may allow for a No. **9.11A** coordination procedure instead of No. **9.21** if the necessary material can be matured to give assurance of such a method. Satellite datalink applications using the AMS(R)S allocation within a portion of the frequency band 136-137 MHz may be considered by a future competent world radiocommunication conference when additional technical studies and coordination planning for all AM(R)S communication types are fully developed.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD **USA/AI 1.7/1**

75.2-137.175 MHz

<table>
<tr><th colspan="3">Allocation to services</th></tr>
<tr><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td rowspan="4">75.2-87.5
FIXED
MOBILE except aeronautical mobile

5.175 5.179 5.187</td><td colspan="2">75.2-75.4
FIXED
MOBILE
5.179</td></tr>
<tr><td>75.4-76
FIXED
MOBILE</td><td>75.4-87
FIXED
MOBILE</td></tr>
<tr><td rowspan="2">76-88
BROADCASTING
Fixed
Mobile

5.185</td><td>5.182 5.183 5.188</td></tr>
<tr><td rowspan="2">87-100
FIXED
MOBILE
BROADCASTING</td></tr>
<tr><td>87.5-100
BROADCASTING

5.190</td><td>88-100
BROADCASTING</td></tr>
<tr><td>100-108</td><td colspan="2">BROADCASTING
5.192 5.194</td></tr>
<tr><td>108-117.975</td><td colspan="2">AERONAUTICAL RADIONAVIGATION
5.197 5.197A</td></tr>
</table>

117.975-136	AERONAUTICAL MOBILE (R) AERONAUTICAL MOBILE SATELLITE (R) **ADD** 5.A17 5.111 5.200 5.201 5.202
136-137	AERONAUTICAL MOBILE (R) 5.111 5.200 5.201 5.202

ADD **USA/AI 1.7/2**

5.A17 In the frequency band 117.975 - 136 MHz, the use of the aeronautical mobile-satellite (R) service is subject to agreement obtained under No. **9.21** and administrations shall take all necessary steps to protect and not constrain assignments to stations of the aeronautical mobile (R) service in frequency range 117.975 - 137 MHz. The use of this band by the aeronautical mobile-satellite (R) service shall be limited to systems that operate and are planned in accordance with recognized international aeronautical standards.

Reasons: Draft studies have not fully demonstrated how these new AMS(R)S systems will be implemented or coordinated, and the still unknown effect VHF datalink services would have. As such, Article 9.21 should be applied to ensure a managed implementation of voice communications only by each state. Since the relay of AMS(R)S voice communications will be supplemental to ground-based stations and not constrain their current or future usage, such use shall take measures to protect the frequencies assigned to stations of the aeronautical mobile (R) service when assigning frequencies to stations of the aeronautical mobile-satellite (R) service.

SUP **USA/A1.7/3**

RESOLUTION 428 (WRC-19)

Studies on a possible new allocation to the aeronautical mobile-satellite (R) service within the frequency band 117.975-137 MHz in order to support aeronautical VHF communications in the Earth-to-space and space-to-Earth directions

Reasons: This resolution may be suppressed by WRC-23 because of a decision to add a new provision in Article **5** for AMS(R)S.

WAC-23/054 (08.22.2022)

UNITED STATES OF AMERICA

DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda Item 1.8

Agenda Item 1.8: *to consider, on the basis of ITU R studies in accordance with Resolution **171 (WRC 19)**, appropriate regulatory actions, with a view to reviewing and, if necessary, revising Resolution **155 (Rev.WRC-19)** and No. **5.484B** to accommodate the use of fixed-satellite service (FSS) networks by control and non-payload communications of unmanned aircraft systems*;

Background: Agenda item 1.8 was established to revise Resolution **155 (Rev.WRC-19)**. This resolution was initially adopted by WRC-15 on the use of geostationary-satellite networks in the fixed-satellite service in certain frequency bands for the control and non-payload communications (CNPC) of unmanned aircraft systems (UAS). Report ITU-R M.2171 identifies the spectrum requirements for unmanned aircraft (UA) command and non-payload communication (CNPC) that would be needed to support flight through non-segregated airspace.

Studies on technical and regulatory conditions carried out in advance of WRC-15 showed that the use of FSS networks for UA CNPC is feasible under certain conditions. These conditions include flight scenarios which were provided by ICAO and the existing FSS framework. Furthermore, ICAO studies showed that – based on given FSS characteristic envelopes – the FSS based UAS CNPC can be a working solution compliant to the Standards and Recommended Practices (SARPs) for the RPAS C2 Link[1].

WRC-15, under its agenda item 1.5, considered the possibility to use fixed-satellite service (FSS) networks to provide UAS CNPC links and adopted Resolution **155 (WRC-15)** in order to benefit the opportunity of using existing satellite transponders. Recognizing the need for further studies on regulatory provisions and technical criteria both within ICAO and ITU, WRC-15 decided that consideration of the outcome of these studies, also taking into account the progress obtained by ICAO in the completion of its SARPs on the use of FSS for the UAS CNPC links, would again be considered by WRC-23.

WRC-23 agenda item 1.8 was therefore established by WRC-19 to, in accordance with Resolution **171 (WRC-19)**, consider appropriate regulatory actions, with a view to reviewing and, if necessary, revising Resolution **155 (Rev.WRC-19)** and No. **5.484B** to accommodate the use of FSS networks by control and non-payload communications of unmanned aircraft systems.

On the basis of the studies called for by Resolutions **171 (WRC-19)** and **155 (Rev.WRC-19)** that define the conditions for operating in the FSS (see *resolves* 19 of Resolution **155 (Rev.WRC-19)**) in the frequency bands for which No. **5.484B** already applies, revisions to Resolution **155 (Rev.WRC-19)** and RR No. **5.484B** are proposed to accommodate the use of FSS networks by UAS CNPC systems.

Proposal:

[1] In ICAO, an "unmanned aircraft system" (UAS) is referred to as a "*Remotely piloted aircraft system*" (RPAS), the CNPC link is referred to as *C2 Link* (Command and Control).

MOD USA/1.8/1

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

10.7-11.7 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
…	…	
10.95-11.2 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B (Earth-to-space) 5.484 MOBILE except aeronautical mobile	**10.95-11.2** FIXED FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B MOBILE except aeronautical mobile	
…	**…**	
11.45-11.7 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B (Earth-to-space) 5.484 MOBILE except aeronautical mobile	**11.45-11.7** FIXED FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B MOBILE except aeronautical mobile	

11.7-13.4 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
11.7-12.5 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492	**11.7-12.1** FIXED 5.486 FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B 5.488 Mobile except aeronautical mobile 5.485	**11.7-12.2** FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492

	12.1-12.2 FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B 5.488 5.485 5.489	5.487 5.487A
	12.2-12.7 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492 5.487A 5.488 5.490	**12.2-12.5** FIXED FIXED-SATELLITE (space-to-Earth) MOD 5.484B MOBILE except aeronautical mobile BROADCASTING 5.487 5.484A
5.487 5.487A		
12.5-12.75 FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B (Earth-to-space) 5.494 5.495 5.496	**12.7-12.75** FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile	**12.5-12.75** FIXED FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B MOBILE except aeronautical mobile BROADCASTING-SATELLITE 5.493
…		

MOD USA/1.8/2

14-14.5 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
14-14.25	FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A MOD 5.484B 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.504C 5.506A Space research 5.504A 5.505	
14.25-14.3	FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A MOD 5.484B 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.508A Space research 5.504A 5.505 5.508	

14.3-14.4 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A MOD 5.484B 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radionavigation-satellite 5.504A	**14.3-14.4** FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A MOD 5.484B 5.506 5.506B Mobile-satellite (Earth-to-space) 5.506A Radionavigation-satellite 5.504A	**14.3-14.4** FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A MOD 5.484B 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radionavigation-satellite 5.504A
14.4-14.47 MOD 5.484B 5.506 5.506B	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Space research (space-to-Earth) 5.504A	
…		

MOD USA/1.8/3

18.4-22 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
…		
19.7-20.1 FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B 5.516B 5.527A Mobile-satellite (space-to-Earth) 5.524	**19.7-20.1** FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B 5.516B 5.527A MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528 5.529	**19.7-20.1** FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B 5.516B 5.527A Mobile-satellite (space-to-Earth) 5.524
20.1-20.2 5.527A	FIXED-SATELLITE (space-to-Earth) 5.484A MOD 5.484B 5.516B MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528	
…		

MOD USA/1.8/4

24.75-29.9 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
…		
29.5-29.9 FIXED-SATELLITE (Earth-to-space) 5.484A MOD 5.484B 5.516B 5.527A 5.539 Earth exploration-satellite (Earth-to-space) 5.541 Mobile-satellite (Earth-to-space) 5.540 5.542	**29.5-29.9** FIXED-SATELLITE (Earth-to-space) 5.484A MOD 5.484B 5.516B 5.527A 5.539 MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.525 5.526 5.527 5.529 5.540	**29.5-29.9** FIXED-SATELLITE (Earth-to-space) 5.484A MOD 5.484B 5.516B 5.527A 5.539 Earth exploration-satellite (Earth-to-space) 5.541 Mobile-satellite (Earth-to-space) 5.540 5.542

MOD USA/1.8/5

29.9-34.2 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
29.9-30 5.527A	FIXED-SATELLITE (Earth-to-space) 5.484A MOD 5.484B 5.516B 5.539 MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.543 5.525 5.526 5.527 5.538 5.540 5.542	
…		

MOD USA/1.8/6

5.484B ~~Resolution **155 (WRC-15)*** shall apply~~This frequency band, may also be used for the control and non-payload communication of unmanned aircraft systems in accordance with Resolution **155 (Rev.WRC-23)**. Such use shall be limited to internationally standardized aeronautical systems. (WRC-~~15~~23)

~~* *Note by the Secretariat:* This Resolution was revised by WRC-19.~~

Reason: Modification of the footnote improves the clarity to the services and systems for which it applies. Modifications to the Table of Frequency Allocations are to reflect the modified footnote.

MOD USA/1.8/7

RESOLUTION 155 (REV.WRC-23~~19~~)

Regulatory provisions related to earth stations on board unmanned aircraft which operate with geostationary-satellite networks in the fixed-satellite service in certain frequency bands not subject to a Plan of Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems in non-segregated airspaces*

The World Radiocommunication Conference (~~Sharm el Sheikh~~Dubai, 20~~19~~23),

considering

a) that the operation of unmanned aircraft systems (UAS) requires reliable control and non-payload communication (CNPC) links, in particular to relay air traffic control communications and for the remote pilot to control the flight;

b) that satellite networks may be used to provide CNPC links of UAS beyond the line-of-sight, as shown in Annex 1 to this Resolution;

c) that CNPC links between space stations and stations on board unmanned aircraft (UA) are ~~proposed~~ permitted to be operated under this Resolution in the primary fixed-satellite service (FSS) in frequency bands shared with other primary services, including terrestrial services, however that would not preclude the use of other available allocations to accommodate this application,

considering further

that UAS CNPC links relate to the safe operation of UAS and have to comply with certain technical, operational and regulatory requirements,

noting

a) that WRC-15 adopted Resolution **156 (WRC-15)** on the use of earth stations in motion communicating with geostationary satellite orbit (GSO) FSS space stations in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz;

b) that Report ITU-R M.2171 provides information on characteristics of UAS and spectrum requirements to support their safe operation in non-segregated airspace,

recognizing

a) that the UAS CNPC links will operate in accordance with international standards and recommended practices (SARPs) and procedures established in accordance with the Convention on International Civil Aviation;

b) that, in this Resolution, conditions are provided for operations of CNPC links without prejudging whether the International Civil Aviation Organization (ICAO) would be able to develop SARPs to ensure safe operation of UAS under these conditions;

c) that Section VI of Article **22** contains limits on equivalent isotropically radiated power at off-axis angles of 3 degrees or more for earth stations of a geostationary satellite network in the fixed-satellite service in the frequency bands 14-14.47 GHz and 29.5-30 GHz;

* May also be used consistent with international standards and practices approved by the responsible civil aviation authority.

d) that terrestrial services operate in the frequency bands 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.1 GHz (Region 2), 12.1-12.2 GHz (on the territory of the country listed in No. **5.489**), 12.2-12.5 GHz (Region 3), 12.5-12.75 GHz (on the territory of the countries listed in No. **5.494** and in Region 3);

e) that terrestrial services also operate in the frequency bands 14.0-14.3 GHz (on the territory of countries listed in No. **5.505**), 14.25-14.3 GHz (on the territory of countries listed in No. **5.508**), 14.3-14.4 GHz (Regions 1 and 3), and 14.4-14.47 GHz;

f) that CNPC links using earth stations onboard unmanned aircraft are not subject to the regulatory provisions that apply to earth stations in motion (ESIM),

resolves

1 that ~~assignments to stations of~~ , for CNPC links using Earth stations onboard Unmanned Aircraft ("CNPC UA ES") communicating with a GSO FSS ~~networks operating in~~space station within the frequency bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.5 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Regions 1 and 3 and 19.7-20.2 GHz (space-to-Earth), and in the frequency bands 14-14.47 GHz (Earth-to-space) and 29.5-30.0 GHz (Earth-to-space), ~~may be used for UAS CNPC links in non-segregated airspace*, provided that~~ or parts thereof, are an application of the primary FSS and the following conditions ~~specified in *resolves* below are met;~~shall apply:

1.1 with respect to space services in the frequency bands referred to in *resolves* 1, the notifying administration of the GSO FSS network shall ensure that its CNPC UA ES complies with the following conditions:

1.1.1 with respect to satellite networks or systems of other notifying administrations, the CNPC UA ES characteristics shall remain within the envelope of characteristics of the typical earth stations associated with the satellite network with which the CNPC UA ES communicates;

1.1.2 that CNPC UA ES shall be designed and operated so as to be able to meet their required performance with interference caused by other satellite networks resulting from application of Articles **9** and **11** and the use of CNPC UA ES shall not cause more interference and shall not claim more protection than any typical earth station in that GSO FSS network;

1.1.3 the operation of CNPC UA ES shall comply with the coordination agreements for the frequency assignments of the typical earth station of the GSO FSS networks obtained under the relevant provisions of the Radio Regulations, taking into account *resolves* 3.4;

~~2 that earth stations in motion on board UA may communicate with the space station of a GSO FSS network operating in the frequency bands listed in *resolves* 1 above, provided that the class of the earth station in motion on board UA is matched with the class of the space station and that other conditions of this Resolution are met (see also *instructs the Director of the Radiocommunication Bureau* 3 below);~~

~~3 that the frequency bands specified in *resolves* 1 shall not be used for the UAS CNPC links before the adoption of the relevant international aeronautical SARPs consistent with Article 37 of the Convention on International Civil Aviation, taking into account *instructs the Director of the Radiocommunication Bureau* 4;~~

~~4 that administrations responsible for an FSS network providing UA CNPC links shall apply the relevant provisions of Articles **9** (necessary provisions need to be identified or developed) and **11** for the relevant assignments, including, as appropriate, assignments to the corresponding space station, specific~~

~~* May also be used consistent with international standards and practices approved by the responsible civil aviation authority.~~

~~and typical earth station and earth station in motion on board UA, including the request for publication in the International Frequency Information Circular (BR IFIC) of items referred to in *resolves* 2 and the course of actions identified in that *resolves* in order to obtain international rights and recognition as specified in Article **8**;~~

1.1.4 for the implementation of *resolves* 1.1.1, the notifying administration for the GSO FSS networks with which the CNPC UA ES communicate shall, in accordance with this Resolution, notify the assignments under No. **11.2** by sending to the Radiocommunication Bureau (BR) information on assignments for which the UG station class shall be applied or, alternatively, the relevant Appendix **4** notification information related to the characteristics of the CNPC UA ES intended to communicate with those GSO FSS networks, together with the commitment that the CNPC UA ES operation shall be in conformity with the Radio Regulations, including this Resolution;

1.1.5 operation of UAS CNPC links shall not adversely affect the existing and future satellite networks coordination agreements or the regular satellite coordination process;

1.2 with respect to terrestrial services in the frequency bands referred to in *resolves* 1, the notifying administration of the GSO FSS network shall ensure that its CNPC UA ES complies with the following conditions:

1.2.1 receiving CNPC UA ES in the frequency bands referred to in *recognizing d)* shall be designed and operated so as to be able to accept the interference without complaints under Article **15** from stations of terrestrial services to which the frequency band is allocated when those stations of terrestrial services operate in accordance with the Radio Regulations;

1.2.2 transmitting CNPC UA ES in the frequency bands referred to in *recognizing e)* shall be designed and operated so as to not cause harmful interference to stations of terrestrial services to which the frequency band is allocated when those terrestrial stations operate in accordance with the Radio Regulations, and Annex 2 (see *instructs the Director of the Radiocommunication Bureau* 1) to this Resolution shall apply so as to set the conditions for protecting terrestrial services from harmful interference in neighbouring countries in these frequency bands;

1.2.3 higher pfd levels than those provided in Annex 2 produced by CNPC UA ES on the surface of the Earth within any administration shall be subject to the prior agreement of that administration and such agreement shall not affect other countries that are not party to that agreement;

1.3 that, in order to protect the radio astronomy service in the frequency band 14.47-14.5 GHz, the notifying administration of the GSO FSS network operating CNPC UA ES in accordance with this Resolution in the frequency band 14-14.47 GHz within line-of-sight of radio astronomy stations are urged to take all practicable steps to ensure that the emissions from CNPC UA ES in the frequency band 14.47-14.5 GHz do not exceed the level and percentage of data loss given in the most recent versions of Recommendations ITU-R RA.769 and ITU-R RA.1513;

~~5 that earth stations of UAS CNPC links shall operate within the notified and recorded technical parameters of the associated satellite network, including specific or typical earth stations of the GSO FSS network(s) as published by the Radiocommunication Bureau (BR);~~

~~6 that earth stations of UAS CNPC links shall not cause more interference to, or claim more protection from, other satellite networks and systems than specific or typical earth stations as indicated in *resolves* 5 as published by BR;~~

~~7 that, in order to apply *resolves* 6 above, administrations responsible for the FSS network to be used for UAS CNPC links shall provide the level of interference for the reference assignments of the network used for CNPC links upon request by an administration authorizing the use of UAS CNPC links within its territory;~~

~~8 that earth stations of UAS CNPC links of a particular FSS network shall not cause more interference to, or claim more protection from, stations of terrestrial services than specific or typical earth stations of that FSS network as indicated in *resolves* 5 that have been previously coordinated and/or notified under relevant provisions of Articles **9** and **11**;~~

2 that CNPC UA ES:

2.1 using station class UG are permitted to communicate with a space station of a GSO FSS satellite network operating in the frequency bands listed in *resolves* 1 and limited to the frequency bands listed in *resolves* 1 when communicating with a space station of a GSO FSS satellite network under this Resolution;

~~9 that the use of~~ 2.2 assignments of an FSS satellite network ~~for UAS CNPC links~~ shall not constrain other FSS satellite networks beyond those already imposed by typical earth stations associated with the network during the application of the provisions of Articles **9** and **11**

nor ~~10 that the introduction of UAS CNPC links shall not~~ result in additional coordination constraints on terrestrial services under Articles **9** and **11**;

2.3 in the application of this Resolution does not provide a regulatory status different from that derived from the GSO FSS networks with which they communicate, taking into account the provisions referred to in this Resolution (see *resolves* 3.4);

~~11 that earth stations on board UA shall be designed and operated so as to be able to accept the interference caused by terrestrial services operating in conformity with the Radio Regulations in the frequency bands listed in *resolves* 1 without complaints under Article **15**;~~

~~12 that earth stations on board UA shall be designed and operated so as to be able to operate with interference caused by other satellite networks resulting from application of Articles **9** and **11**;~~

~~13~~3 that, in order to ensure freedom from harmful interference, that may affect ~~safety-of-flight~~ operation of UAS, the notifying administration~~s~~ of the GSO FSS network shall cooperate with the administration of the country in which the UA is registered ~~responsible for operating UAS CNPC links shall~~to:

~~–~~3.1 ensure that the use of ~~UAS CNPC links~~CNPC UA ES ~~be~~ is in accordance with international standards and recommended practices (SARPs) consistent with Article 37 of the Convention on International Civil Aviation;

~~–~~3.2 take the required measures, consistent with No. **4.10**, to ensure freedom from harmful interference to ~~earth stations on board UA~~CNPC UA ES and operated in accordance with this Resolution;

~~–~~3.3 act immediately when their attention is drawn to any such harmful interference, as freedom from harmful interference to ~~UAS CNPC links~~CNPC UA ES is imperative to ensure their safe operation, taking into account *resolves* ~~11~~ 1.2.1;

~~–~~3.4 use assignments associated with the GSO FSS networks for ~~UAS CNPC links~~CNPC UA ES (see Figure 1 in Annex 1), including frequency assignments to space stations, specific or typical earth stations and ~~earth stations on board UA~~CNPC UA ES (see *resolves* 2.2), that have been successfully coordinated under Article **9** (including provisions identified in *resolves* ~~4~~ 1.1.4) and recorded in the Master International Frequency Register (MIFR) with a favourable finding under Article **11**, including Nos. **11.31, 11.32** or **11.32A** where applicable, and except those frequency assignments that have not successfully completed coordination procedures under No. **11.32** by applying Appendix **5** § 6.d.i (see *instructs the Director of the Radiocommunication Bureau* 2);

~~ensure that real-time interference monitoring, estimation and prediction of interference risks and planning solutions for potential interference scenarios are addressed by FSS operators and UAS operators with guidance from aviation authorities;~~

~~14 that, unless otherwise agreed between the administrations concerned, UA CNPC earth stations shall not cause harmful interference to terrestrial services of other administrations (see also Annex 2 to this Resolution);~~

3.5 use techniques to maintain antenna pointing accuracy for the operation of CNPC UA ES with the associated GSO FSS satellites, without inadvertently tracking adjacent GSO satellites;

3.6 take all necessary measures so that CNPC UA ES are subject to permanent monitoring and control by a network control and monitoring centre (NCMC) or equivalent facility in order to comply with the provisions in this Resolution;

3.7 provide NCMC or equivalent facility permanent points of contact for the purpose of tracing any suspected cases of harmful interference from CNPC UA ES and to immediately respond to requests from the points of contact of authorizing administrations;

4 that the notifying administration of the GSO FSS network shall ensure

4.1 that the operation of CNPC UA ES within the territories, including territorial waters and territorial airspaces, of an administration shall be carried out only if authorized by that administration;

4.2 that the authorization to a UAS CNPC earth station to operate in the territory under the jurisdiction of another administration shall not release the notifying administration of the GSO FSS network with which UAS CNPC earth station communicates from the obligation to comply with the provisions included in this Resolution and those contained in the Radio Regulations,

~~15 that, in order to implement *resolves* 14 above, power flux density (pfd) hard limits need to be developed for UAS CNPC links; possible examples of such provisional limits to protect the fixed service are provided in Annex 2; subject to agreement between the administrations concerned, that annex may be used for the implementation of this Resolution;~~

~~16 that the pfd hard limits provided in Annex 2 shall be reviewed and, if necessary, revised by WRC-23[1];~~

~~17 that, in order to protect the radio astronomy service in the frequency band 14.47-14.5 GHz, administrations operating UAS in accordance with this Resolution in the frequency band 14-14.47 GHz within line-of-sight of radio astronomy stations are urged to take all practicable steps to ensure that the emissions from the UA in the frequency band 14.47-14.5 GHz do not exceed the levels and percentage of data loss given in the most recent versions of Recommendations ITU-R RA.769 and ITU-R RA.1513;~~

~~18 to consider the progress obtained by ICAO in the process of preparation of SARPs for UAS CNPC links, to review this Resolution at WRC-23, taking into account the results of the implementation of Resolution **156 (WRC-15)**, and to take necessary actions as appropriate;~~

~~19 that the ITU Radiocommunication Sector (ITU-R) studies on technical, operational and regulatory aspects in relation to the implementation of this Resolution shall be completed, together with the adoption of relevant ITU-R Recommendations defining the technical characteristics of CNPC links and conditions of sharing with other services,~~

~~*encourages administrations*~~

~~1 to provide the relevant information where available in order to facilitate the application of *resolves* 6;~~

~~[1] WRC-19 received a proposal from one regional organization regarding protection of the fixed service using a revised pfd mask as contained in Annex 2 section b). ITU-R is invited, in continuing its study on the implementation of this Resolution, to consider this mask and take necessary action as appropriate.~~

~~2 to participate actively in the studies referred to in *invites the ITU Radiocommunication Sector* by submitting contributions to ITU-R,~~

~~*invites the 2023 World Radiocommunication Conference*~~

~~to consider the results of the above studies referred to in this Resolution with a view to reviewing and, if necessary, revising this Resolution, and take necessary actions, as appropriate,~~

~~*invites the ITU Radiocommunication Sector*~~

~~to conduct, as a matter of urgency, relevant studies of technical, operational and regulatory aspects in relation to the implementation of this Resolution[1],~~

instructs the Director of the Radiocommunication Bureau

1 upon receipt of the notification information referred to in *resolves* 1.1.4, the BR shall examine it with respect to conformity with *resolves* 1.1.1, the commitment received as required by *resolves* 1.1.4, conformity with *resolves* 3.4, and commitment to the conformity with the power flux-density (pfd) limits on the Earth's surface specified in Annex 2 and with any agreements obtained as referred to in *resolves* 1.2.3;

2 if the finding from the examination in *instructs* 1 is favourable, the BR shall publish the modified or additional assignment along with the results of such examinations in the International Frequency Information Circular (BR IFIC) and the modified or additional assignment shall retain the priority date of protection with that of the existing assignment,

~~to examine the relevant part of this Resolution requiring actions to be taken by administrations to implement this Resolution, with a view to sending it to administrations and posting it on the ITU website;~~

~~2 to present to subsequent WRCs a progress report relating to the implementation of this Resolution;~~

~~3 to define a new class of station in order to be able to process satellite network filings submitted by administrations for earth stations providing UA CNPC links, after the Resolution is implemented, in accordance with this Resolution, and publish the information as referred to in *resolves* 4;~~

~~4 not to process satellite network filing submissions by administrations with a new class of a station for earth stations providing UA CNPC links before *resolves* 1-12 and 14-19 of this Resolution are implemented;~~

~~5 to report to subsequent WRCs on the progress made by ICAO on the development of SARPs for UAS CNPC links,~~

instructs the Secretary-General

to bring this Resolution to the attention of the Secretary General of ICAO~~,~~

~~*invites the International Civil Aviation Organization*~~

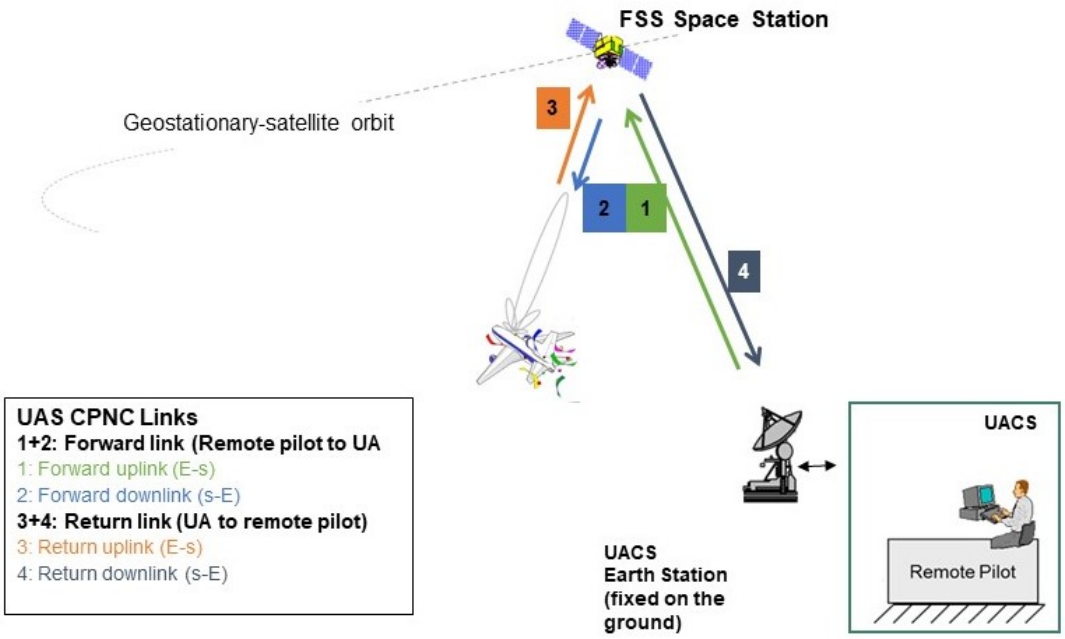
~~to provide to the Director of BR, in time for WRC-23, information on ICAO efforts regarding implementation of UAS CNPC links, including the information related to the development of SARPs for UAS CNPC links.~~

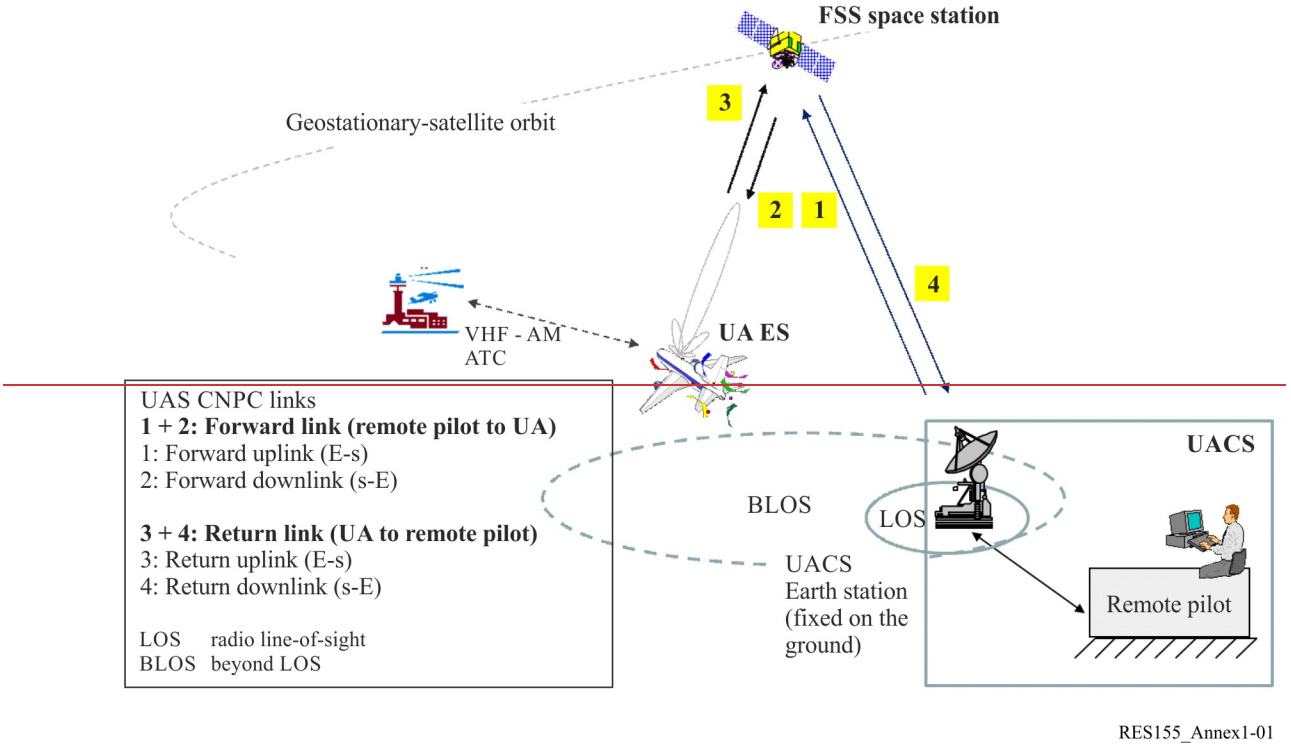
ANNEX 1 TO RESOLUTION 155 (REV.WRC-19)

UAS CNPC links

FIGURE 1

Elements of UAS architecture using the FSS





RES155_Annex1-01

ANNEX 2 TO RESOLUTION 155 (REV.WRC-~~19~~23)

Protection of ~~the fixed~~ terrestrial services from ~~UAS~~ CNPC UA ES emissions

~~**a) Example provided to WRC-15**~~

~~The fixed service is allocated by table entries and footnotes in several countries with co-primary status with FSS. Conditions of UA using CNPC shall be such that the fixed service is protected from any harmful interference as follows:~~

~~An earth station on board UA in the frequency band 14.0-14.47 GHz shall comply with provisional power flux-density (pfd) limits described below:~~

~~$-132 + 0.5 \cdot \theta$ dB(W/(m^2 · MHz)) for $0° \leq \theta \leq 40°$~~

~~-112 dB(W/(m^2 · MHz)) for $40° < \theta \leq 90°$~~

~~where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal).~~

~~NOTE – The aforementioned limits relate to the pfd and angles of arrival that would be obtained under free-space propagation conditions.~~

~~**b) Example provided to WRC-19**~~

An earth station on board UA in the frequency band 14.0-14.3 GHz shall comply with the pfd limits described below, on the territory of countries listed in No. **5.505**:

$$15\log(\theta+0.9)-124 \text{ dB}\left(\text{W}/\left(\text{m}^2\cdot\text{MHz}\right)\right) \quad \text{for } 0° \leq \theta \leq 90°$$

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal).

An earth station on board UA:

– in the frequency band 14.25-14.3 GHz on the territory of countries listed in No. **5.508**;

– in the frequency band 14.3-14.4 GHz in Regions 1 and 3;

– in the frequency band 14.4-14.47 GHz worldwide,

shall comply with the pfd limits described below:

$$15\log(\theta+0.9)-133.5\text{dB}\left(\text{W}/\left(\text{m}^2\cdot\text{MHz}\right)\right) \quad \text{for } 0° \leq \theta \leq 90°$$

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal).

NOTE – The aforementioned limits relate to the pfd and angles of arrival that would be obtained under free-space propagation conditions.

Reason: Modifications to Resolution **155 (Rev.WRC-19)** removes provisions that are no longer required, improves clarity on actionable responsibilities, and eliminates duplications.

MOD USA/1.8/8

APPENDIX 4 (REV.WRC-19)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

ANNEX 2

Characteristics of satellite networks, earth stations or radio astronomy stations[2] (Rev.WRC-12)

Table of characteristics to be submitted for space and radio astronomy services
(Rev.WRC -12)

TABLE A

GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK OR SYSTEM, EARTH STATION OR RADIO ASTRONOMY STATION (Rev.WRC-19)

Items in Appendix	*A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION*	*Advance publication of a geostationary-satellite network*	*Advance publication of a non-geostationary-satellite network subject to coordination under Section II*	*Advance publication of a non-geostationary-satellite network not subject to coordination under Section II*	*Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)*	*Notification or coordination of a non-geostationary-satellite network*	*Notification or coordination of an earth station (including notification under Appendices 30A or 30B)*	*Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)*	*Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)*	*Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)*	*Items in Appendix*	*Radio astronomy*
* * *	* * *										* * *	
A.25	**COMPLIANCE WITH NOTIFICATION OF GSO FSS NETWORKS USING CNPC UA ES (CONTROL AND NON-PAYLOAD COMMUNICATIONS USING EARTH STATIONS ONBOARD UNMANNED AIRCRAFT COMMUNICATING WITH A GSO FSS SATELLITE NETWORK)**											
A.25.a	information on satellite network assignments for which the UG station class shall be applied Required only for (1) the bands listed in *resolves* 1 of Resolution **155 (Rev.WRC-23),** when a CNPC UA earth station in the fixed-satellite service communicates with a space station in the fixed-satellite service and (2) when not submitting Appendix 4 notification information in accordance with *resolves* 1.1.4 of Resolution **155 (Rev.WRC-23)**				+						A.25.a	

Items in Appendix	*A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION*	*Advance publication of a geostationary-satellite network*	*Advance publication of a non-geostationary-satellite network subject to coordination under Section II*	*Advance publication of a non-geostationary-satellite network not subject to coordination under Section II*	*Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)*	*Notification or coordination of a non-geostationary-satellite network*	*Notification or coordination of an earth station (including notification under Appendices 30A or 30B)*	*Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)*	*Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)*	*Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)*	*Items in Appendix*	*Radio astronomy*
A.25.b	a commitment that the that the CNPC UA ES operation shall be in conformity with the required commitment in *resolves* 1.1.4 of Resolution **155 (Rev.WRC-23)** Required only for the bands listed in *resolves* 1 of Resolution **155 (Rev.WRC-23)**, when a CNPC UA earth station in the fixed-satellite service communicates with a space station in the fixed-satellite service				+						A.25.b	
A.26.c	information on Network Control and Monitoring Centre NCMC or equivalent facility permanent points of contact consistent with *resolves* 3.7 of Resolution **155 (Rev.WRC-23)** Required only for the bands listed in *resolves* 1 of Resolution **155 (Rev.WRC-23)**, when a CNPC UA earth station in the fixed-satellite service communicates with a space station in the fixed-satellite service				+						A.26.c	

Items in Appendix	*A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION*	*Advance publication of a geostationary-satellite network*	*Advance publication of a non-geostationary-satellite network subject to coordination under Section II*	*Advance publication of a non-geostationary-satellite network not subject to coordination under Section II*	*Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)*	*Notification or coordination of a non-geostationary-satellite network*	*Notification or coordination of an earth station (including notification under Appendices 30A or 30B)*	*Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)*	*Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)*	*Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)*	*Items in Appendix*	*Radio astronomy*
A.26.d	a commitment that unless an agreement is received pursuant to *resolves* 1.2.3 of Resolution **155 (Rev.WRC-23)** that the notifying administration shall meet the PFD limits in Annex 2 of Resolution **155 (Rev.WRC-23)** Required only for the bands and territories listed in *recognizing e)* of Resolution **155 (Rev.WRC-23)** when a CNPC UA earth station in the fixed-satellite service communicates with a space station in the fixed-satellite service				+						A.26.d	

SUP USA/1.8/9

RESOLUTION 171 (WRC-19)

Review and possible revision of Resolution 155 (Rev.WRC-19) and No. 5.484B in the frequency bands to which they apply

Reason: Consequential action.

WAC-23/055 (08.22.2022)

WRC-23 Agenda Item 1.10
IWG-1 Update

WRC-23 agenda item 1.10 seeks to address possible new allocations for the aeronautical mobile service for the use of non-safety aeronautical mobile applications. IWG-1 has continued discussions on this agenda item for several meetings but has not developed any recommended preliminary views or proposals to date.

IWG-1 reviewed document **WAC-23/051 (08.22.2022)** containing the NTIA RCS proposal for agenda item 1.10 but offers no further views or comments to the FCC on this document at this time.

WAC-23/056 (08.22.2022)

UNITED STATES OF AMERICA

DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

AGENDA ITEM 1.11: *to consider possible regulatory actions to support the modernization of the Global Maritime Distress and Safety System and the implementation of e-navigation, in accordance with Resolution **361 (Rev.WRC-19)**;*

BACKGROUND INFORMATION:

Resolves 3 of Resolution **361 (Rev.WRC-19)** invites WRC-23, to consider regulatory provisions, if any, based on the results of ITU-R studies referred to in *invites the ITU Radiocommunication Sector*, to support the introduction of additional satellite systems into the GMDSS.

An additional GSO MSS system is being considered by the IMO to provide satellite communication within GMDSS on a *regional*, uses primary MSS allocations within the frequency bands 1 610-1 626.5 MHz (Earth-to-space) and 2 483.5-2 500 MHz (space-to-Earth). The primary MSS allocations in those bands are also used by other non-GSO MSS systems operating on a worldwide basis.

Frequency coordination of the GSO MSS system has not been completed with the existing non-GSO MSS systems with date priority, nor with terrestrial services in some countries. This lack of coordination raises concern that:

- There is potential harmful interference caused by the GSO MSS, including to on non-GSO system providing GMDSS safety-of-life services. In the event that harmful interference is caused by the GSO MSS system into those satellite systems and terrestrial services, such interference must be immediately eliminated (see RR No. **11.42**). However, interference mitigation procedures would occur after harmful interference has already occurred. Interference causes to existing GMDSS services could be life threatening.
- There is also potential for harmful interference to be caused to the candidate GMDSS GSO MSS. In the event that harmful interference is received by the GSO MSS system, from global non-GSO MSS systems with date priority and terrestrial services in some countries and other allocated services, such interference must be accepted. In this situation, GMDSS services from the candidate GSO MSS system will not be protected. This is not suitable for a safety service.

Further, *Resolves 3* of Resolution **361 (Rev.WRC-19)** requires that activities of the IMO are taken into account to determine the disposition of this agenda item. Only the IMO can recognize and administer systems participating in its GMDSS. If the IMO does not recognize a system,

there is no need to change the Radio Regulations to accommodate a system the IMO does not recognize.

Proposal:

For Issue C: Introduction of additional satellite systems into the Global Maritime Distress Safety System

NOC USA/1.11/1

Radio Regulations Volumes 1 and 2

No change to the Radio Regulations. Suppress *resolves 3* of Resolution **361 (Rev.WRC-19*)***.

Reasons: The IMO has not recognized the subject satellite network, and the conditions for making changes under *resolves* 3 of Resolution **361** have not been met:

(1) The IMO has not recognized the proposed satellite network for participation in the GMDSS. Without this approval, the satellite network cannot provide GMDSS, and so there is no need to modify the Radio Regulations.

(2) Spectrum needs for a new GMDSS system have not been identified. Resolves 3 of Resolution **361** invites ITU-R to, among other things, determine the spectrum needs for a new satellite GMDSS system but this has not been undertaken.

(3) Frequency coordination under Article **9** of the Radio Regulations has not been completed. Without successful coordination of the proposed system, it does not receive protection. Provisions of Article **9** of the Radio Regulations require completion of coordination in order to provide any degree of protection from harmful interference for the satellite GMDSS system from existing MSS satellite systems with higher priority operating in the same frequency bands. The administration responsible for the proposed additional satellite GMDSS system has not completed Article **9** satellite coordination successfully, and consequently the proposed network is not entitled to protection from harmful interference. Further, in the case of harmful interference to other notified satellite networks operating in the frequency bands considered, the GMDSS system would be required to terminate its services immediately and would not be able to provide a service to its users in the frequency bands considered.

SUP USA/1.11/2

RESOLUTION 361 (REV.WRC-19)

Consideration of possible regulatory actions to support modernization of the Global Maritime Distress and Safety System and the implementation of e-navigation

Reasons: Considering that studies under *resolves* 3, Resolution 361 (REV.WRC-19) are complete and that the conditions listed above are not met, this Resolution is proposed to be suppressed with respect to *resolves* 3, Resolution 361 (REV.WRC-19)

_____

WAC 57 (09.12.2022)

WRC-23 Agenda Item 1.2
With Respect to the 3300-3400 MHz and 3600-3800 MHz frequency bands

IWG-2 members were not able to reach consensus on a proposal for WRC-23 agenda item (AI) 1.2 with respect to the 3300-3400 MHz and 3600-3800 MHz frequency bands and, therefore, forwards three views on how the FCC should handle this matter.

View A addresses AI 1.2 for the 3300-3400 MHz and 3600-3800 MHz bands. This proposal would identify the full 3300 – 3800 MHz tuning range for IMT in Region 2, aligning it with the 3GPP standardized band class for 5G (n77 or 3300 – 4200 MHz). View A proposes to upgrade the mobile service to primary status in the 3300-3400 MHz band with the condition of not causing harmful interference to, or claim protection from, stations operating in the radiolocation service; the 3300- 3400 MHz band is also proposed to be identified for International Mobile Telecommunications (IMT) on a regional basis. This proposal enables the United States (US) the flexibility to use the band for future 5G operations while maintaining the same regulatory provisions agreed at WRC-15 to ensure the protection of U.S. government radar operations from cross-border interference. For the 3600 – 3800 MHz band, this proposal identifies the band for IMT on a regional basis, consistent with the FCC's Citizens Broadband Radio Service and C-Band rules. Given the existing mobile allocation, this proposal adds no additional regulatory burden to the use of the band, which is essential as recent auction winners continue to build out this critical mid-band 5G spectrum that will support fast, reliable and ubiquitous service. By identifying the band for IMT, the FCC would support harmonizing its 5G actions throughout the region, promoting solutions to bridge the digital divide by bringing the promise of next-generation wireless services for everyone, everywhere and bringing the consumer benefits of economies of scale.
View A is supported by AT&T, CTIA, Ericsson, GSMA, Nokia, Qualcomm, Samsung, and Verizon. Also, T-Mobile supports the proposal for the 3300 – 3400 MHz band.

View B addresses AI 1.2 for the 3600 -3800 MHz band. The proposal identifies the 3600-3700 MHz band regionally and 3700-3800 MHz by country footnote to IMT. The reason for the country footnote approach in the 3700-3800 MHz is that U.S. licensed satellites provide service in that band across Region 2 as well as in Alaska, Hawaii and US territories. View B also maintains a power flux density (PFD) at country borders to provide a level of protection to Fixed Satellite Service (FSS) receive earth station in neighbouring countries but also allows the PFD to be exceeded in countries that so agree. This proposal reflects the reality of the use of the band across Region 2, where some countries continue to use the band to provide FSS and other have allowed/deployed IMT systems. The proposal is aligned with Resolution **245** that states identification of frequency bands for IMT should take into account the use of the frequency bands by other services and the evolving needs of these services.
View B is supported by Intelsat, National Association of Broadcasters, One Media 3.0, LLC, and SES Americom.

View C addresses the 3300-3400 MHz band recommending that the U.S. adopt no change to the table of allocations and no change to footnotes Radio Regulations (RR) Nos. **5.429C** and **5.429D** under AI 1.2. The reason is that (1) ITU-R sharing studies show that IMT and radiolocation coexistence is not possible in the same or nearby geographical areas requiring very large separation distances and as such IMT deployments in one country would impact radiolocation in other countries and (2) the U.S., domestically, has not made a determination as to whether or how a mobile use would operate within the 3300-3400 MHz band. The National Spectrum Consortium established the PATHSS Task Group drawing upon the expertise of a cross-section of participants who represent the wireless and the aerospace and defense industries to study this band to develop innovative solutions that may be possible given that traditional

ITU-R sharing mechanisms are not feasible. Any uniquely formulated implementation of mobile use in the U.S. is unlikely to be duplicated internationally. Without a clear and effective mechanism in place to protect radiolocation of one country from mobile/IMT operations of another, there is no basis for the U.S. to pursue a 3300-3400 MHz regional mobile co-primary allocation or regional IMT identification and should not drive international policy that could potentially expand mobile/IMT deployments in the band. View C is supported by Lockheed Martin.

VIEW A:

Draft

United States of America

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 1.2

Agenda item 1.2: *to consider identification of the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution* ***245 (WRC-19)****;*

BACKGROUND
Source: GT/CMR-23/doc.022r1

Mobile broadband plays a crucial and fundamental role in providing access to information for businesses and consumers worldwide. Mobile broadband users are also demanding higher data rates and are increasingly using mobile devices to access audio-visual content. The mobile industry continues to drive technological innovations in order to meet these evolving user demands. In 2020, the first year of the pandemic, the number of Internet users grew by 10.2 per cent, the largest increase in a decade, driven by developing countries where Internet use went up 13.3 per cent. According to ITU estimates, the number of active mobile-cellular telephone subscriptions per 100 inhabitants continues to grow strongly, reaching 110 subscriptions per 100 inhabitants, including a record number of mobile subscriptions with broadband capacity (3G or better).[1] Ninety-five percent of the world's population lives within reach of a mobile broadband service, and the relatively small difference in the number of subscriptions between developed and developing countries demonstrates that connectivity is a priority among people in countries at all levels of development.[2]

The evolution of International Mobile Telecommunications (IMT), which provides wireless telecommunication services on a worldwide scale, has contributed to global economic and social development. IMT systems are now being evolved to provide applications such as enhanced mobile broadband, massive machine-type communications and ultra-reliable and low-latency communications.

[1] https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2021.pdf

[2] https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2021.pdf

The demand for mobile wireless broadband applications such as IMT continues to grow dramatically as does the need for access to radio spectrum to support that growth.[3] ~~In November 2015, ITU-R approved Recommendation ITU-R M.2083 "Framework and overall objectives of the future development of IMT for 2020", which highlights three key usage scenarios for IMT-2020: enhanced mobile broadband, massive machine type communications, and ultra-reliable and low latency communications. The success of these usage scenarios, in both developed and developing countries, will rely on both spectrum availability for the terrestrial IMT-2020 systems and the support of high capacity backhaul capabilities (including fiber, wireless, satellite and microwave solutions).~~ Fifth generation (5G) provides improved data rates and reduced latency. Importantly 5G has been designed to enable capabilities in a wide range of industries including healthcare, transportation, manufacturing, education, and telemedicine; 5G is expected to have a broad impact on our economies and societies. Recognizing the need to consider additional mid-band spectrum bands – with its favourable mix of coverage and capacity - in the range 3 300 MHz to 10.5 GHz to support the terrestrial component of IMT, WRC-19 approved WRC-23 agenda item 1.2. ITU-R, standards development organizations, and industry continue to progress the work on the development of IMT-2020.

~~Beyond the results of both WRC-15 and WRC-19, the challenge for the future is now to focus efforts on the frequency range 3 300 MHz to 10.5 GHz. This is a great opportunity to meet the technical and spectral needs for the future development of IMT-2020 systems, better known as 5G.~~

WRC-23 agenda item 1.2 (Resolution 245 (WRC-19)) calls for sharing and compatibility studies, with a view to ensuring the protection of services to which the frequency band is allocated on a primary basis, without imposing additional regulatory or technical constraints on those services, and also, as appropriate, on services in adjacent bands, for the frequency bands:

- 3 300-3 400 MHz and 3 600-3 800 MHz and (Region 2);
- 3 300-3 400 MHz (amend footnote in Region 1);
- 7 025-7 125 MHz (globally);
- 6 425-7 025 MHz (Region 1);
- 10.0-10.5 GHz (Region 2).

3 300 – 3 400 MHz

The 3300 – 3400 MHz frequency band is part of a globally-standardized band for 5G. 3GPP has specifications (n77 or 3.3-4.2 GHz band) for the operation of both Long- Term Evolution (LTE) and 5G NR in these bands and there are already significant deployments worldwide along with the required ecosystem to enable those deployments. Seventy percent or nearly 140 operators are investing their 5G deployments in this range. The 3300 – 3400 MHz band is also included in existing frequency arrangements harmonized in CITEL[4] and the ITU-R[5]. In Region 2, the Radio Regulations footnote Nos. **5.429C** and **5.429D** provide primary allocations to the Mobile Service and identification for IMT respectively, while in other regions there are primary allocations to the Mobile Service via Nos. **5.429,** Nos. **5.429A, and** Nos. **5.429C,** with identifications to IMT via Nos. **5.429B** and Nos. **5.429E**.

[3] Ericsson predicts that total mobile traffic is expected to increase by a factor of five over the next six years, reaching 164 exabytes per month by the end of 2025. Ericsson reports that today, smartphones generate about 95% of total mobile data traffic, and that by 2025, 5G networks will carry about half of the world's mobile data traffic. *See* Ericsson, Mobility Report at 20 (2020), https://www.ericsson.com/49da93/assets/local/mobility-report/documents/2020/june2020-ericsson-mobility-report.pdf. Cisco estimates that, by 2022, 22% of global internet traffic will come from mobile networks, up from 12% in 2017. *See* Cisco Systems Inc., Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017-2022 White Paper (2019), https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-738429.html.

[4] PCC.II/REC.54 (XXIX-17)

[5] Rec. ITU-R M.1036-6 (10/2019)

The United States uses the band 3 300-3 500 MHz for operating various types of government high-resolution/powered shipborne, land-based, and aeronautical mobile radar systems. ITU-R sharing studies indicated that separation distances and/or exclusion zones are required in the proximity of these radars to ensure their protection.

3 600 – 3 800 MHz

The 3 600 – 3 800 MHz frequency band is part of a globally-standardized band for 5G. 3GPP has specifications (n77 or 3.3-4.2 GHz band) for the operation of both Long- Term Evolution (LTE) and 5G NR in these bands and there are already significant deployments worldwide along with the required ecosystem to enable those deployments. The 3 600- 3 800 MHz frequency band is globally allocated to the Fixed-Satellite Service (FSS) (space-to-Earth) on a co-primary basis with Fixed and Mobile services in Region 2. GSO FSS satellites have and continue to provide services across the Americas. C-band GSO satellites provide services including distribution of television and radio broadcasting programs, telephone and data services to consumers, back-haul to mobile terrestrial operators, and feeder links for mobile-satellite services. Additionally, C-band is used for reception of essential telemetry FSS satellite signals.[6]

In the United States the Federal Communications Commission (FCC), as part of its efforts to facilitate 5G network deployments and ensure the continued access for C-band spectrum for FSS services, adopted new rules and auctioned 280 MHz of spectrum in the 3700 – 3980 MHz in the contiguous United States and maintained 200 MHz for FSS operations in the 4000-4200 MHz band. In Alaska, Hawaii, and insular territories, where dependence on C-band FSS services is more significant, the full 3700-4200 MHz band continues to be used to deliver FSS. ITU-R sharing studies have indicated separation distances (e.g. 7.5 - 26 km) are required to ensure the protection of FSS earth station receivers from terrestrial IMT operations. Cross-border coordination between IMT and the FSS is feasible when the deployment of IMT is limited to the areas outside of the required separation distances for each azimuth to protect each specific FSS earth stations. In the case of bilateral coordination, the FSS protection criteria along with the FSS antenna elevation angle, should be used to determine the necessary separation distances to ensure protection of FSS earth stations.

PROPOSALS
Source: GT/CMR-23/doc.022r1

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD DIAP/1.2(3.3-3.4GHz)/1
Supports: B, EQA, USA

[6] *See Expanding Flexible Use of the 3.7-4.2 GHz Band*, Report and Order and Order of Proposed Modification, FCC 20-22, at para. 9 (rel. Mar. 3, 2020) ("*FCC C-Band Order*"), https://docs.fcc.gov/public/attachments/FCC-20-22A1.pdf.

2 700-3 600 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
3 300-3 400 RADIOLOCATION 5.149 5.429 5.429A 5.429B 5.430	**3 300-3 400** RADIOLOCATION MOBILE ADD 5.12A1 MOD 5.429D Amateur Fixed<br~~Mobile~~ 5.149 MOD 5.429C ~~5.429D~~	**3 300-3 400** RADIOLOCATION Amateur 5.149 5.429 5.429E 5.429F

Reasons: The identification of mid-band frequency spectrum for IMT is essential to be able to address digitalization (e.g., sustainable smart cities, industries) and reduce the digital divide in the Americas.

MOD DIAP/1.2(3.3-3.4GHz)/2
Supports: B, EQA, USA

5.429C *Different category of service*: in ~~Argentina, Belize, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, El Salvador, Ecuador, Guatemala, Mexico, Paraguay and Uruguay, the frequency band 3 300-3 400 MHz is allocated to the mobile, except aeronautical mobile, service on a primary basis.~~ ~~In~~ Argentina, Brazil, the Dominican Republic, Guatemala, Mexico, Paraguay and Uruguay, the frequency band 3 300-3 400 MHz is ~~also~~ allocated to the fixed service on a primary basis. Stations in the fixed ~~and mobile~~ service~~s~~ operating in the frequency band 3 300-3 400 MHz shall not cause harmful interference to, or claim protection from, stations operating in the radiolocation service. (WRC-~~19~~23)

Reasons: The identification of mid-band frequency spectrum for IMT is essential to be able to address digitalization (e.g., sustainable smart cities, industries) and reduce the digital divide in the Americas.

MOD DIAP/1.2(3.3-3.4GHz)/3
Supports: [B], [EQA], USA

5.429D In ~~the following countries in~~ Region 2~~: Argentina, Belize, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, El Salvador, Ecuador, Guatemala, Mexico, Paraguay and Uruguay,~~ the use of the frequency band 3 300-3 400 MHz is identified for the implementation of International Mobile Telecommunications (IMT). ~~Such use shall be in accordance with Resolution **223 (Rev.WRC-19)**.~~ [This use in Argentina, Paraguay and Uruguay is subject to the application of No. **9.21**.] ~~The use of the frequency band 3 300-3 400 MHz by IMT stations in the mobile service shall not cause harmful interference to, or claim protection from, systems in the radiolocation service, and administrations wishing to implement IMT shall obtain the agreement of neighboring countries to protect operations within the radiolocation service.~~ This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. (WRC-~~19~~23)

Reason: Modification to the RR 5.429D to extend it to the entire Region 2.

ADD DIAP/1.2(3.3-3.4GHz)/4
Supports: B, EQA, USA

5.12AI Stations in the mobile service operating in the frequency band 3 300-3 400 MHz in Region 2 shall not cause harmful interference to, or claim protection from, stations operating in the radiolocation service. (WRC-23~~19~~)

Reasons: The identification of mid-band frequency spectrum for IMT is essential to be able to address digitalization (e.g., sustainable smart cities, industries) and reduce the digital divide in the Americas.

MOD PP/1.2(3.6-3.8GHz)/5
Supports: CAN, USA

3 600-4 800 MHz

<table>
<tr><th colspan="3">Allocation to services</th></tr>
<tr><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td rowspan="3">3 600-4 200
FIXED
FIXED-SATELLITE (space-to-Earth)
Mobile</td><td>3 600-3 700
FIXED
FIXED-SATELLITE (space-to-Earth)
MOBILE except aeronautical mobile MOD 5.434
Radiolocation 5.433</td><td>3 600-3 700
FIXED
FIXED-SATELLITE (space-to-Earth)
MOBILE except aeronautical mobile
Radiolocation
5.435</td></tr>
<tr><td>3 700-3 800
FIXED
FIXED-SATELLITE (space-to-Earth)
MOBILE except aeronautical mobile MOD 5.434</td><td>3 700-3 800
FIXED
FIXED-SATELLITE (space-to-Earth)
MOBILE except aeronautical mobile</td></tr>
<tr><td colspan="2">3 ~~7~~800-4 200
FIXED
FIXED-SATELLITE (space-to-Earth)
MOBILE except aeronautical mobile</td></tr>
<tr><td>4 200-4 400</td><td colspan="2">AERONAUTICAL MOBILE (R) 5.436
AERONAUTICAL RADIONAVIGATION 5.438
5.437 5.439 5.440</td></tr>
<tr><td>4 400-4 500</td><td colspan="2">FIXED
MOBILE 5.440A</td></tr>
<tr><td>4 500-4 800</td><td colspan="2">FIXED
FIXED-SATELLITE (space-to-Earth) 5.441
MOBILE 5.440A</td></tr>
</table>

Reasons: The identification of sufficient mid-band frequency spectrum for IMT is essential to be able to address digitalization (e.g., sustainable smart cities, industries) and reduce the digital divide in the Americas.

MOD PP/1.2(3.6-3.8**GHz)/7**

5.434 In Region 2~~Canada, Chile, Colombia, Costa Rica, El Salvador, the United States and Paraguay~~, the frequency band 3 600-3 ~~7~~8**7**00 MHz, or portions thereof, is identified for use by ~~these~~ administrations wishing to implement International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. ~~At the stage of coordination the provisions of Nos. **9.17** and **9.18** also apply. Before an administration brings into use a base or mobile station of an IMT system, it shall seek agreement under No. **9.21** with other administrations and ensure that the power flux-density (pfd) produced at 3 m above ground does not exceed −154.5 dB(W/(m^2 · 4 kHz)) for more than 20% of time at the border of the territory of any other administration. This limit may be exceeded on the territory of any country whose administration has so agreed. In order to ensure that the pfd limit at the border of the territory of any other administration is met, the calculations and verification shall be made, taking into account all relevant information, with the mutual agreement of both administrations (the administration responsible for the terrestrial station and the administration responsible for the earth station), with the assistance of the Bureau if so requested. In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account the information referred to above.~~ Stations of the mobile service, including IMT systems, in the frequency band 3 600-3 ~~8~~7**8**00 MHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations ~~(Edition of 2004)~~. (WRC-23~~19~~)

Reasons: The identification of sufficient mid-band frequency spectrum for IMT is essential to be able to address digitalization (e.g., sustainable smart cities, industries) and reduce the digital divide in the Americas.

VIEW B:

Draft

United States of America

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 1.2

Agenda item 1.2: *to consider identification of the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution* ***245 (WRC-19)****;*

BACKGROUND
Source: GT/CMR-23/doc.022r1

Mobile broadband plays a crucial and fundamental role in providing access to information for businesses and consumers worldwide. Mobile broadband users are also demanding higher data rates and are increasingly using mobile devices to access audio-visual content. The mobile industry continues to drive technological innovations in order to meet these evolving user demands. In 2020, the first year of the pandemic, the number of Internet users grew by 10.2 per cent, the largest increase in a decade, driven by developing countries where Internet use went up 13.3 per cent. According to ITU estimates, the number of active mobile-cellular telephone subscriptions per 100 inhabitants continues to grow strongly, reaching 110 subscriptions per 100 inhabitants, including a record number of mobile subscriptions with broadband capacity (3G or better).[1] Ninety-five percent of the world's population lives within reach of a mobile broadband service, and the relatively small difference in the number of subscriptions between developed and developing countries demonstrates that connectivity is a priority among people in countries at all levels of development.[2]
The evolution of International Mobile Telecommunications (IMT), which provides wireless telecommunication services on a worldwide scale, has contributed to global economic and social development. IMT systems are now being evolved to provide applications such as enhanced mobile broadband, massive machine-type communications and ultra-reliable and low-latency communications.

The demand for mobile wireless broadband applications such as IMT continues to grow dramatically as does the need for access to radio spectrum to support that growth.[3] ~~In November 2015, ITU-R approved~~

[1] https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2021.pdf

[2] https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2021.pdf

[3] Ericsson predicts that total mobile traffic is expected to increase by a factor of five over the next six years, reaching 164 exabytes per month by the end of 2025. Ericsson reports that today, smartphones generate about 95% of total mobile data traffic, and that by 2025, 5G networks will carry about half of the

~~Recommendation ITU-R M.2083 "Framework and overall objectives of the future development of IMT for 2020", which highlights three key usage scenarios for IMT-2020: enhanced mobile broadband, massive machine type communications, and ultra reliable and low latency communications. The success of these usage scenarios, in both developed and developing countries, will rely on both spectrum availability for the terrestrial IMT-2020 systems and the support of high capacity backhaul capabilities (including fiber, wireless, satellite and microwave solutions).~~ Fifth generation (5G) provides improved data rates and reduced latency. Importantly 5G has been designed to enable capabilities in a wide range of industries including healthcare, transportation, manufacturing, education, and telemedicine; 5G is expected to have a broad impact on our economies and societies. Recognizing the need to consider additional mid-band spectrum bands ~~-~~with its favourable mix of coverage and capacity~~-~~ in the range 3 300 MHz to 10.5 GHz to support the terrestrial component of IMT, WRC-19 approved WRC-23 agenda item 1.2. ITU-R, standards development organizations, and industry continue to progress the work on the development of IMT-2020.

~~Beyond the results of both WRC-15 and WRC-19, the challenge for the future is now to focus efforts on the frequency range 3 300 MHz to 10.5 GHz. This is a great opportunity to meet the technical and spectral needs for the future development of IMT-2020 systems, better known as 5G.~~

WRC-23 agenda item 1.2 (Resolution 245 (WRC-19)) calls for sharing and compatibility studies, with a view to ensuring the protection of services to which the frequency band is allocated on a primary basis, without imposing additional regulatory or technical constraints on those services, and also, as appropriate, on services in adjacent bands, for the frequency bands:

- 3 300-3 400 MHz and 3 600-3 800 MHz and (Region 2);
- 3 300-3 400 MHz (amend footnote in Region 1);
- 7 025-7 125 MHz (globally);
- 6 425-7 025 MHz (Region 1);
- 10.0-10.5 GHz (Region 2).

3 600 – 3 800 MHz

The 3400-4200 MHz frequency band is globally allocated to the Fixed-Satellite Service (FSS) (space-to-Earth) on a co-primary basis with Fixed and Mobile services in Region 2. GSO FSS satellites have and continue to provide services across the Americas. C-band GSO satellites provide services including distribution of television and radio broadcasting programs, telephone and data services to consumers, back-haul to mobile terrestrial operators, and feeder links for mobile-satellite services. Additionally, C-band is used for reception of essential telemetry FSS satellite signals.[4] In Alaska, Hawaii, and insular U.S. territories, C-band satellite services are more extensively used and relied upon for an even greater set of applications including essential VSAT networks, communications for

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world's mobile data traffic. *See* Ericsson, Mobility Report at 20 (2020), https://www.ericsson.com/49da93/assets/local/mobility-report/documents/2020/june2020-ericsson-mobility-report.pdf. Cisco estimates that, by 2022, 22% of global internet traffic will come from mobile networks, up from 12% in 2017. *See* Cisco Systems Inc., Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017-2022 White Paper (2019), https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-738429.html.

[4] *See Expanding Flexible Use of the 3.7-4.2 GHz Band*, Report and Order and Order of Proposed Modification, FCC 20-22, at para. 9 (rel. Mar. 3, 2020) ("*FCC C-Band Order*"), https://docs.fcc.gov/public/attachments/FCC-20-22A1.pdf.

emergency services, tele-medicine/education and backhaul for telecommunications restoration in the event of a disaster.

In the United States the Federal Communications Commission (FCC), as part of its efforts to facilitate 5G network deployments and ensure the continued access for C-band spectrum for FSS services, adopted new rules and auctioned 280 MHz of spectrum in the 3700 – 3980 MHz in the contiguous United States and maintained 200 MHz for FSS operations in the 4000-4200 MHz band. In Alaska, Hawaii, and U.S. insular territories, where dependence on C-band FSS services is more significant, the full 3700-4200 MHz band continues to be used to deliver FSS. ITU-R sharing studies have indicated separation distances of tens to hundreds of km, depending on assumptions used, are required to ensure the protection of FSS receivers from terrestrial IMT operations. Cross-border coordination between IMT and the FSS is feasible when the deployment of IMT is limited to the areas outside of the required separation distances for each azimuth to protect each specific FSS earth stations or an area for unlicensed/ubiquitous C-band earth station deployment. In the case of bilateral coordination, the FSS protection criteria along with the FSS antenna elevation angle, should be used to determine the necessary separation distances to ensure protection of FSS earth stations.

PROPOSALS

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD PP/1.2(3.6-3.8GHz)/1

3 600-4 800 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
3 600-4 200 FIXED FIXED-SATELLITE (space-to-Earth) Mobile	**3 600-3 700** FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile MOD 5.434 Radiolocation 5.433	**3 600-3 700** FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile Radiolocation 5.435
	3 700-3 800 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile ADD 5.XXX	**3 700-3 800** FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile
	3 7800-4 200 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile	
4 200-4 400	AERONAUTICAL MOBILE (R) 5.436 AERONAUTICAL RADIONAVIGATION 5.438 5.437 5.439 5.440	
4 400-4 500	FIXED MOBILE 5.440A	
4 500-4 800	FIXED FIXED-SATELLITE (space-to-Earth) 5.441 MOBILE 5.440A	

Reasons: To identify spectrum for IMT in the certain bands regionally or on a country basis.

MOD PP/1.2(3.6-3.7 GHz)/2

5.434 In Region 2~~Canada, Chile, Colombia, Costa Rica, El Salvador, the United States and Paraguay~~, the frequency band 3 600-3 700 MHz, or portions thereof, is identified for use by ~~these~~ administrations wishing to implement International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. ~~At the stage of coordination the provisions of Nos. **9.17** and **9.18** also apply. Before a~~An administration deploying ~~brings into use~~ a base or mobile station of an IMT system~~, it~~ shall ~~seek agreement under No. **9.21** with other administrations and~~ ensure that the power flux-density (pfd) produced at 3 m above ground does not exceed −154.5 dB(W/(m^2 · 4 kHz)) for more than 20% of time at the border of the territory of any other administration. This limit may be exceeded on the territory of any country whose administration has so agreed. ~~In order to ensure that the pfd limit at the border of the territory of any other administration is met, the calculations and verification shall be made, taking into account all relevant information, with the mutual agreement of both administrations (the administration responsible for the terrestrial station and the administration responsible for the earth station), with the assistance of the Bureau if so requested.~~ In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account all relevant~~the~~ information provided by the administrations~~referred to above~~. Stations of the mobile service, including IMT systems, in the frequency band 3 600-3 700 MHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations ~~(Edition of 2004)~~. (WRC-23~~19~~)

ADD PP/1.2(3.7-3.8 GHz)/3

5.XXX In the United States, [other R2 countries], the frequency band 3 700-3 800 MHz, or portions thereof, is identified for use by these administrations wishing to implement International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. An administration deploying base or mobile station of an IMT system shall ensure that the power flux-density (pfd) produced at 3 m above ground does not exceed −154.5 dB (W/(m^2 · 4 kHz)) for more than 20% of time at the border of the territory of any other administration. This limit may be exceeded on the territory of any country whose administration has so agreed. In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account all relevant information provided by the administrations. Stations of the mobile service, including IMT systems, in the frequency band 3 600-3 700 MHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations. (WRC-23)

Reasons: To identify spectrum for IMT while continuing to ensure the protection and continued operation of the FSS in Region 2.

VIEW C:

Draft

United States of America

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 1.2

Agenda item 1.2: *to consider identification of the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **245 (WRC-19)**;*

BACKGROUND:
Currently, the 3300-3400 MHz band is allocated to the radiolocation service on a primary basis in all three regions. In Region 2, the mobile service is allocated on a secondary basis regionally, on a primary basis in some countries through RR No. **5.429C**, and identified for IMT in a limited number of countries through footnote RR No. **5.429D**. The United States is not included in either footnote. The existing footnote RR No. **5.429D** requires agreement between administrations prior to implementing IMT in order to protect radiolocation operations. Ultimately, RR No. **5.429D** maintains that IMT shall not claim protection from radiolocation and shall not cause harmful interference to radiolocation. This can only be achieved through bilateral discussion and agreement among affected countries.
ITU-R sharing studies show that mobile/IMT and radiolocation coexistence is not possible in the same or nearby geographical areas due to the significant exceedance mobile/IMT operations would cause to the radiolocation protection criteria. These studies indicated that separation distances and/or exclusion zones greater than 300 km are required in some cases, and that means coexistence is not feasible. As a result, IMT deployments in one country would impact radiolocation of other administrations. The 3300-3400 MHz band continues to be a critical band for radiolocation. The United States uses the band for operating various types of high-resolution/powered shipborne, land-based, and aeronautical mobile radar systems.
Elevating mobile from secondary to primary in Region 2 and expanding the limited IMT identification to a region-wide IMT identification would further exacerbate the lack of a technical mechanism to share spectrum between the radiolocation and mobile services; would require significant bilateral discussions that have no rational basis for successful conclusion; and would place limitations on IMT deployments in the 3300-3400 MHz band. As a result, the U.S. proposes No Change to the 3300-3400 MHz band under WRC-23 Agenda Item 1.2.

PROPOSAL:

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

NOC **USA/1.2/1**

2 700-3 600 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
…		
…	**3 300-3 400** RADIOLOCATION Amateur Fixed Mobile 5.149 5.429C 5.429D	**…**
…		

Reasons: ITU sharing and compatibility studies show that sharing between IMT and Radiolocation in this frequency band is not feasible.

NOC **USA/1.2/2**

5.429C

Reasons: ITU sharing and compatibility studies show that sharing between IMT and Radiolocation in this frequency band is not feasible. There can be no expansion of this note to a regional note or change in status.

NOC **USA/1.2/3**

5.429D

Reasons: ITU sharing and compatibility studies show that sharing between IMT and Radiolocation in this frequency band is not feasible. There can be no expansion of this note to a regional note or change in status or obligations.

_____

WAC-23/58 (09.12.2022)

United States of America

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 1.4

AGENDA ITEM 1.4: *to consider, in accordance with Resolution **247 (WRC-19)**, the use of high-altitude platform stations as IMT base stations (HIBS) in the mobile service in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level;*

BACKGROUND:

WRC-23 agenda item 1.4 proposed to study the use of HIBS in certain frequency bands below 2700 MHz, or portions thereof, in accordance with Resolution **247 (WRC-19)**.

HIBS are high-altitude platform IMT base stations. No. **1.66A** defines a high-altitude platform station as a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth. No. **4.23** limits transmissions to or from high-altitude platform stations to bands specifically identified in Article 5.

WRC-2000 identified through No. **5.388A** the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2110-2170 MHz in Regions 1 and 3 and the bands 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2 that may be used by high-altitude platform stations as base stations to provide IMT, in accordance with Resolution **221 (Rev.WRC-07)**.

The ITU-R carried out sharing and compatibility studies between proposed HIBS systems and various incumbent services and systems in the bands proposed in WRC-23 Agenda Item 1.4 as well as in adjacent bands. The United States has a number of important uses for the bands under consideration for WRC-23 Agenda Item 1.4, including:

- Commercial wireless IMT networks, public safety communications, and other private radio services in the 694-960 MHz range.
- Aviation safety systems in both the aeronautical radionavigation and aeronautical mobile (route) services in the 960-1164 MHz band. These systems operate in accordance with International Civil Aviation Organization standards in all phases of flight.
- Commercial wireless IMT networks within the 1710-1885 MHz band.
- Operational tactical radio relay, terrestrial telemetering operations, and fixed point-to-point microwave applications in the fixed and mobile/aeronautical mobile services and space operations Earth-to-space in the 1780-1850 MHz band.
- Commercial wireless IMT networks in the 2 500 – 2 690 MHz band.
- Radio astronomy observatories within the frequency 2 690-2 700 MHz band, subject to footnote RR **No. 5.340**.
- Aeronautical Radionavigation Service (ARNS) Air Traffic Control (ATC) radars and Meteorological radars within the frequency band 2 700-2 900 MHz.

694-960 MHz:

The studies that the ITU-R conducted between proposed HIBS systems and IMT terrestrial systems operating within the 694-960 MHz range show that separation distances larger than 500 km between the HIBS coverage center (nadir) and a ground based IMT network are required to protect IMT terrestrial networks from proposed HIBS co-channel operation in the 694-960 MHz frequency range. It was also observed that the increase in interference to IMT UEs due to co-channel HIBS transmissions leads to high average Down Link (DL) throughput degradation for a ground-based IMT network even at distances as large as 500 km between the HIBS coverage center and a ground-based IMT network. In addition, some neighboring administrations have differing frequency arrangements for terrestrial IMT in 694-960 MHz, which increases complexity relative to the introduction of HIBS systems.

Therefore, sharing between HIBS and IMT systems in the same geographical area is not feasible in this band.

1 710-1 885 MHz:

The studies that the ITU-R conducted between proposed HIBS systems and IMT terrestrial systems operating in the 1 710-1 885 MHz band show that separation distances larger than 300 km between the HIBS coverage center and a ground based IMT network are required to protect IMT terrestrial networks from proposed HIBS co-channel operation in the 1 710-1 885 MHz frequency band. The ITU-R studies conducted with the fixed service operating in the frequency band show that the protection criteria is exceeded at a maximum of 497 km for point-to-point systems.

Therefore, sharing between HIBS and incumbent services in the same geographical area is not feasible in this band.

2 500-2 690 MHz:

The studies that the ITU-R conducted between proposed HIBS systems and IMT terrestrial systems operating in the 2500-2690 MHz band show that separation distances larger than 500 km between the HIBS coverage center and a ground based IMT network are required to protect IMT terrestrial networks from proposed HIBS co-channel operation in the 2 500-2 690 MHz frequency band. In addition, some neighboring administrations have differing frequency arrangements for terrestrial IMT in 2500-2690 MHz, which increases complexity relative to the introduction of HIBS systems.

Therefore, sharing between HIBS and IMT systems in the same geographical area is not feasible in this band.

Proposal:

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

Issue A: 694-960 MHz

NOC USA/1.4/1

460-890 MHz

<table>
<tr><th colspan="3">Allocation to services</th></tr>
<tr><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td colspan="3">…</td></tr>
<tr><td>470-694
BROADCASTING

5.149 5.291A 5.294 5.296
5.300 5.304 5.306 5.312</td><td rowspan="2">614-698
BROADCASTING
Fixed
Mobile
5.293 5.308 5.308A 5.309</td><td rowspan="5">610-890
FIXED
MOBILE 5.296A 5.313A
5.317A
BROADCASTING</td></tr>
<tr><td>694-790
MOBILE except aeronautical
mobile 5.312A 5.317A
BROADCASTING
5.300 5.312</td></tr>
<tr><td>790-862
FIXED
MOBILE except aeronautical
mobile 5.316B 5.317A
BROADCASTING
5.312 5.319</td><td>698-806
MOBILE 5.317A
BROADCASTING
Fixed

5.293 5.309</td></tr>
<tr><td>862-890
FIXED
MOBILE except aeronautical
mobile 5.317A
BROADCASTING 5.322

5.319 5.323</td><td>806-890
FIXED
MOBILE 5.317A
BROADCASTING

5.317 5.318</td></tr>
<tr><td colspan="2"></td><td>5.149 5.305 5.306 5.307 5.320</td></tr>
</table>

890-1 300 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
890-942 FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING 5.322 Radiolocation 5.323	**890-902** FIXED MOBILE except aeronautical mobile 5.317A Radiolocation 5.318 5.325 **902-928** FIXED Amateur Mobile except aeronautical mobile 5.325A Radiolocation 5.150 5.325 5.326 **928-942** FIXED MOBILE except aeronautical mobile 5.317A Radiolocation 5.325	**890-942** FIXED MOBILE 5.317A BROADCASTING Radiolocation 5.327
942-960 FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING 5.322 5.323	**942-960** FIXED MOBILE 5.317A	**942-960** FIXED MOBILE 5.317A BROADCASTING 5.320
…		

Reasons: The results of ITU-R sharing and compatibility studies between HIBS and incumbent IMT terrestrial systems show that compatibility between HIBS and incumbent services (e.g., terrestrial IMT systems) in the same geographical area is not feasible. The United States therefore proposes no change to the ITU Radio Regulations.

Issue B: 1 710-1 885 MHz

NOC USA/1.4/2

1 710-2 170 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
1 710-1 930 FIXED MOBILE 5.384A 5.388A 5.388B 5.149 5.341 5.385 5.386 5.387 5.388		
…		

Reasons: The results of ITU-R sharing and compatibility studies between HIBS and incumbent IMT terrestrial systems show that compatibility between HIBS and incumbent services (e.g., terrestrial IMT systems) in the same geographical area is not feasible. The United States therefore proposes no change to the ITU Radio Regulations.

Issue C: 1 885-1 980 MHz, 2 010-2 025 MHz, 2 110-2 170 MHz

NOC USA/1.4/3

1 710-2 170 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
1 710-1 930	FIXED MOBILE 5.384A 5.388A 5.388B 5.149 5.341 5.385 5.386 5.387 5.388	
1 930-1 970 FIXED MOBILE 5.388A 5.388B 5.388	**1 930-1 970** FIXED MOBILE 5.388A 5.388B Mobile-satellite (Earth-to-space) 5.388	**1 930-1 970** FIXED MOBILE 5.388A 5.388B 5.388
1 970-1 980	FIXED MOBILE 5.388A 5.388B 5.388	
1 980-2 010	FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.351A 5.388 5.389A 5.389B 5.389F	

2 010-2 025 FIXED MOBILE 5.388A 5.388B 5.388	**2 010-2 025** FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.388 5.389C 5.389E	**2 010-2 025** FIXED MOBILE 5.388A 5.388B 5.388
2 025-2 110 space)	SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to- FIXED MOBILE 5.391 SPACE RESEARCH (Earth-to-space) (space-to-space) 5.392	
2 110-2 120	FIXED MOBILE 5.388A 5.388B SPACE RESEARCH (deep space) (Earth-to-space) 5.388	
2 120-2 160 FIXED MOBILE 5.388A 5.388B 5.388	**2 120-2 160** FIXED MOBILE 5.388A 5.388B Mobile-satellite (space-to-Earth) 5.388	**2 120-2 160** FIXED MOBILE 5.388A 5.388B 5.388
2 160-2 170 FIXED MOBILE 5.388A 5.388B 5.388	**2 160-2 170** FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.388 5.389C 5.389E	**2 160-2 170** FIXED MOBILE 5.388A 5.388B 5.388

Reasons: The results of ITU-R sharing and compatibility studies between HIBS and incumbent IMT terrestrial systems show that compatibility between HIBS and incumbent services (e.g., terrestrial IMT systems) in the same geographical area is not feasible. The United States therefore proposes no change to the ITU Radio Regulations.

Issue D: 2 500-2 690 MHz

NOC USA/1.4/4

2 170-2 520 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
…		

Allocation to services		
Region 1	**Region 2**	**Region 3**
2 500-2 520 FIXED 5.410 MOBILE except aeronautical mobile 5.384A 5.412	**2 500-2 520** FIXED 5.410 FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A	**2 500-2 520** FIXED 5.410 FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A MOBILE-SATELLITE (space-to-Earth) 5.351A 5.407 5.414 5.414A 5.404 5.415A

2 520-2 700 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
2 520-2 655 FIXED 5.410 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.412 5.418B 5.418C	**2 520-2 655** FIXED 5.410 FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.418B 5.418C	**2 520-2 535** FIXED 5.410 FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.403 5.414A 5.415A **2 535-2 655** FIXED 5.410 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.418 5.418A 5.418B 5.418C

2 655-2 670 FIXED 5.410 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.208B 5.413 5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.412	**2 655-2 670** FIXED 5.410 FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.208B	**2 655-2 670** FIXED 5.410 FIXED-SATELLITE (Earth-to-space) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.208B 5.413 5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.420
2 670-2 690 FIXED 5.410 MOBILE except aeronautical mobile 5.384A Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.412	**2 670-2 690** FIXED 5.410 FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.208B 5.415 MOBILE except aeronautical mobile 5.384A Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149	**2 670-2 690** FIXED 5.410 FIXED-SATELLITE (Earth-to-space) 5.415 MOBILE except aeronautical mobile 5.384A MOBILE-SATELLITE (Earth-to-space) 5.351A 5.419 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149
…		

Reasons: The results of ITU-R sharing and compatibility studies between HIBS and incumbent IMT terrestrial systems show that compatibility between HIBS and incumbent services (e.g., terrestrial IMT systems) in the same geographical area is not feasible. The United States therefore proposes no change to the ITU Radio Regulations.

NOC USA/1.4/5

1.66A *high altitude platform station:* A *station* located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth.

Reasons: Modification of the definition of No. **1.66A** would impact previous WRC decisions beyond the scope of WRC-23 AI 1.4.

NOC USA/1.4/6

RESOLUTION 221 (REV. WRC-07)

Use of high altitude platform stations providing IMT in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2

Reasons: The results of ITU-R sharing and compatibility studies between HIBS and incumbent IMT terrestrial systems show that compatibility between HIBS and incumbent services (*e.g.,* terrestrial IMT systems) in the same geographical area is not feasible. The United States therefore proposes no change to the ITU Radio Regulations.

NOC USA/1.4/7

5.338A In the frequency bands 1 350-1 400 MHz, 1 427-1 452 MHz, 22.55-23.55 GHz, 24.25-27.5 GHz, 30-31.3 GHz, 49.7-50.2 GHz, 50.4-50.9 GHz, 51.4-52.4 GHz, 52.4-52.6 GHz, 81-86 GHz and 92-94 GHz, Resolution **750 (Rev.WRC-19)** applies. (WRC-19)

Reasons: That the results of ITU-R sharing and compatibility studies between HIBS and incumbent IMT terrestrial systems show that compatibility between HIBS and incumbent services (*e.g.,* terrestrial IMT systems) in the same geographical area is not feasible. The United States therefore proposes no change to the ITU Radio Regulations.

SUP USA/1.4/8

RESOLUTION 247 (WRC-19)

Facilitating mobile connectivity in certain frequency bands below 2.7 GHz using high-altitude platform stations as International Mobile Telecommunications base stations

Reasons: Consequential action

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WAC-23/59 (09.12.22)

WRC-23 Agenda Item 1.5

IWG-2 members were not able to reach consensus on a proposal for WRC-23 agenda item 1.5 and, therefore, forwards two views on how the FCC should handle this matter.

View A supports the position received from NTIA on behalf of the Executive Branch Agencies. View A proposes "no change" underlined (NOC) to the Radio Regulations in Region 2 and does not take any position on Region 1 or Region 3. According to View A proponents, this view is consistent with the U.S. position of neutrality on this agenda item (as expressed during TG 6/1 meeting US preparatory discussions), which is limited to Region 1.
View A is supported by National Association of Broadcasters, ONE Media 3.0, LLC, Sennheiser, and Shure.

View B proposes "no change" not underlined (NOC) to the Radio Regulations in Region 2. View B also modifies the background of the document received from NTIA to include language encouraging Region 1 countries to support further global harmonization of the 470-694 MHz frequency band for mobile services, including an identification for IMT and language that the agenda item 1.5 decision should not preclude Region 2 administrations from advancing the harmonization of spectrum for IMT. According to View B proponents, this proposal is consistent with the United States' positions to WRC-15 and WRC-19 promoting the harmonization of this band to enable the introduction of innovative broadband services.
View B is supported by AT&T, CTIA, Ericsson, GSMA, Nokia, T-Mobile, and Verizon.

VIEW A:

Draft

United States of America

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 1.5

I.

Agenda Item 1.5: *to review the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consider possible regulatory actions in the frequency band 470-694 MHz in Region 1 on the basis of the review in accordance with Resolution* ***235 (WRC-15)****;*

Background

World Radiocommunication Conference 2023 (WRC-23) agenda item 1.5 addresses the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consideration of possible regulatory actions in the frequency band 470-694 MHz in Region 1.

Part of this band was studied under agenda item 1.1 of WRC-15 and resulted in new mobile allocations and identifications for IMT in portions of the frequency range for some administrations in Regions 2 and 3. Since WRC-15, a total of eight countries in Region 2 and seven in Region 3 have IMT identifications including these bands, with 28 countries in Region 3 having IMT identifications in the 698-790 MHz band.

Internationally harmonized bands benefit consumers, through economies of scale in infrastructure, devices, chipsets, etc., thereby reducing network deployment and consumer costs while simultaneously enabling global roaming. The United States has already made the 614-698 MHz band available for mobile broadband licensees through a successful incentive auction that concluded in April 2017. 3GPP has specified Band 71 (the range 663 – 698 MHz / 617 – 652 MHz) as an operating band for 5G New Radio (NR) and equipment is already available for that band.

Proposal:

NOC (for Region 2) USA/1.5/1

460-890 MHz

Region 2

470-512 BROADCASTING Fixed Mobile 5.292 5.293 5.295
512-608 BROADCASTING 5.295 5.297
608-614 RADIO ASTRONOMY Mobile-satellite except aeronautical mobile-satellite (Earth-to-space)
614-698 BROADCASTING Fixed Mobile 5.293 5.308 5.308A 5.309

Reasons: No change is proposed for Region 2. Any changes made to the Radio Regulations under WRC-23 agenda item 1.5 must not impact the existing allocations and identifications for Region 2, nor subject Region 2 to any changed procedural or regulatory provisions.

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VIEW B:

Draft

United States of America

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 1.5

UNITED STATES OF AMERICA
DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda Item 1.5: *to review the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consider possible regulatory actions in the frequency band 470-694 MHz in Region 1 on the basis of the review in accordance with Resolution* ***235 (WRC-15)****;*

[Note: Modifications shown to RCS Proposal.]

Background

Mobile broadband access has become a key driver of global economic growth, job creation and competitiveness and the COVID-19 pandemic has reinforced the critical importance of wireless connectivity in keeping citizens connected. The spectrum below 1 GHz is exceptionally suited for mobile broadband applications. In particular, the unique propagation characteristics of the bands below 1 GHz allow for in-building penetration and wider area coverage which in turn requires less infrastructure and facilitates service delivery to rural or sparsely populated areas.

World Radiocommunication Conference 2023 (WRC-23) agenda item 1.5 addresses the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consideration of possible regulatory actions in the frequency band 470-694 MHz in Region 1.

Part of this band was studied under agenda item 1.1 of WRC-15 and resulted in new mobile allocations and identifications for IMT in portions of the frequency range for some administrations in Regions 2 and 3.

Since then, 3GPP has specified Band 71 (the range 663 – 698 MHz / 617 – 652 MHz) as an operating band for 5G NR and equipment is already available for that band. The United States made that band available for mobile broadband licensees through a successful incentive auction which concluded in April 2017. Mexico successfully cleared the band in October 2018, thereby releasing the 600 MHz band for mobile broadband use. In April 2019, Canada concluded its 600 MHz auction. The momentum is growing for the 614-698 MHz and 698-790 MHz bands; as of WRC-19, a total of 8 countries in Region 2

and 7 in Region 3 have IMT identifications including these bands, with 28 countries in Region 3 have IMT identifications in the 698-790 MHz band. Internationally harmonized bands benefit consumers, through economies of scale in infrastructure, devices, chipsets, etc., thereby reducing network deployment and consumer costs while simultaneously enabling global roaming.

Region 1 countries are encouraged to support further global harmonization of the 470-694 MHz frequency band for mobile services, including an identification for IMT. Such a regulatory solution would:

(a) Enable administrations to preserve and protect broadcasting and other services in the UHF range,

(b) Consider ways to facilitate the development of future broadcasting systems, and

(c) Allow administrations flexibility to address the mobile spectrum shortage consistent with their domestic requirements.

The United States is of the view that decision on WRC-23 agenda item 1.5 should not preclude Region 2 administrations from advancing the harmonization of spectrum for IMT (e.g. WRC-23 agenda item 8) to enable the introduction of wireless broadband services.

Proposal:

NOC (for Region 2) USA/1.5/1

460-890 MHz

Region 2

470-512 BROADCASTING Fixed Mobile 5.292 5.293 5.295
512-608 BROADCASTING 5.295 5.297
608-614 RADIO ASTRONOMY Mobile-satellite except aeronautical mobile-satellite (Earth-to-space)

614-698 BROADCASTING Fixed Mobile 5.293 5.308 5.308A 5.309

Reasons: WRC-23 Agenda Item 1.5 is limited to technical and regulatory studies for certain terrestrial services only in Region 1 for the frequency band 470-960 MHz. Therefore, no change is proposed for Region 2. Any changes made to the Radio Regulations under WRC-23 agenda item 1.5 must not impact the existing allocations and identifications for Region 2, nor subject Region 2 to any changed procedural or regulatory provisions. This proposal does not address Regions 1 and 3, so those columns of the Table of Frequency Allocations in Article 5 are thus not reproduced above.

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WAC-23/60 (09.12.2022)

UNITED STATES OF AMERICA

DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

[Note: Modifications shown to RCS Proposal.]

Agenda Item 9, topic 9.1 c): *Use of International Mobile Telecommunications systems for fixed wireless broadband in the frequency bands allocated to the fixed service on a primary basis*

Background

~~CPM 23-1 assigned both ITU-R Working Parties 5A and 5C with the responsibility to develop CPM text for WRC-23 agenda item 9.1, topic c):~~

Resolution **175 (WRC-19)** *resolves to invite the ITU Radiocommunication Sector* "to conduct any necessary studies on the use of IMT systems for fixed wireless broadband in the frequency bands allocated to the fixed service on primary basis, taking into account the relevant ITU-R studies, Handbooks, Recommendations and Reports," and *instructs the Director of the Radiocommunication Bureau "*to report to WRC-23 on the results of these studies".

Discussion

The ITU-R has previously developed a set of ITU-R recommendations and a study question ~~already established a framework~~ in which IMT and other mobile technologies can be used to provide fixed wireless access (FWA), including broadband access for fixed and mobile services.~~, in frequencies allocated to the fixed service on a primary basis.~~ However, these relevant F.Series Recommendations regarding FWA are outdated and do not reflect the current capability of wireless broadband technology. Based on the studies undertaken on WRC-23 agenda item 9.1 c), the ITU-R is considering approaches that will seek to revise and update Recommendations F.1401-1 and F.1763-1, so that they are more reflective of the current state of technology for broadband fixed wireless access. Other F.Series Recommendations/Reports relevant to FWA are also being reviewed.

~~Work was performed several years ago by the predecessor group of ITU-R Study Group 5 which developed a body of Recommendations, Reports and Handbooks on Fixed Wireless Access (FWA). This body of work comprises a range of technologies, including IMT, that provide broadband wireless telecommunication applications in a fixed or stationary scenario. However, many of these F-series Recommendations regarding FWA are outdated and do not reflect the current capability of wireless broadband technology. Proponents of using IMT technologies for FWA can revise these existing F-series Recommendations to reflect the current state of wireless broadband technologies, including that of IMT.~~

FWA is a way of providing broadband access using wireless links between fixed points. The evolution of FWA solutions and advent of new use cases can enable FWA operators' further ability to bridge the digital divide and offer connectivity to a broader population and reach underserved areas. Advancements in IMT network technologies have significantly improved the download, upload and latency capabilities of FWA. Given that upgrades to FWA will rely upon 5G standards and equipment, this compatibility makes FWA scalable.

The ITU-R, through the course of its normal Study Group activities, may continue studies towards the development of new, or revision of existing, Reports and Recommendations, to support the future development and use of IMT systems for fixed wireless broadband in the frequency bands allocated to the fixed and mobile services.

Proposals:

NOC **USA/9.1-C/1**

ARTICLE 5

Frequency allocations

Reason: The United States is of the view that changes to the Radio Regulations are ~~typically~~ outside the scope of Agenda item 9.1 topics. No changes to Article 5 including any identification of existing fixed service bands for IMT should be made under this Agenda Item. ~~Given that ITU-R SG 5 has already adopted Recommendations, Reports, and Handbooks regarding the use of mobile system technologies for fixed wireless broadband, a review and revision of these publications, as needed, is adequate to address AI 9.1, topic c).~~

SUP **USA/9.1-C/2**

RESOLUTION 175 (WRC-19)

Use of International Mobile Telecommunications Systems for Fixed Wireless Broadband in the Frequency Bands Allocated to the Fixed Service on a Primary Basis

Reason: Consequential change as no further action is required by WRC-23 to address this topic.

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WAC-23/61 (08.31.2022)

UNITED STATES OF AMERICA

DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda Item 1.19 *to consider a primary allocation to the fixed-satellite service (FSS) in the space-to-Earth direction in the frequency band 17.3-17.7 GHz in Region 2, while ensuring the protection of existing primary services in the band, recognizing the need of preserving and protecting the frequencies subject to the application of Appendix 30A, in accordance with Resolution **174 (WRC-19)**.*

Background Information:

This agenda item addresses the consideration of a new primary allocation for the Fixed-Satellite Service (FSS) in the space-to-Earth direction in the 17.3-17.7 GHz frequency band for Region 2.

In Region 2, the 17.3-17.7 GHz frequency band is allocated to the unplanned broadcasting-satellite service (BSS, by definition, a downlink) and the FSS in the Earth-to-space direction limited to BSS feeder links operating under Appendix **30A** (AP**30A**). An FSS downlink allocation is technologically similar to the operations of the existing BSS allocation, which currently is subject to coordination under No. **9.7** using a coordination trigger defined in Appendix **5.** For ground path interference, where a transmitting feeder link earth station may cause interference with nearby receiving FSS earth stations, sharing procedures exists through the application of site coordination under Article **6** of Appendix **30A** using the coordination area determined by Appendix **7**.

For NGSO FSS operations in this band, the protection of the BSS and the AP30A is ensured by extending the provisions of Article **22** by adding the Region 2 FSS (space-to-Earth) allocation in the frequency band 17.3-17.7 GHz to Table 22-1B for the application of $epfd_{\downarrow}$ and to Table 22-3 for the application of $epfd_{is}$, respectively. Sharing between FSS NGSOs are assured by extending the application of No. **9.12** (NGSO-NGSO coordination) to 17.3-17.7 GHz (space-to-Earth) in Region 2:

Proposals:

MOD USA/AI 1.19/1

TABLE 5-1 (Rev.WRC-~~19~~23)

Technical conditions for coordination
(see Article **9**)

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

15.4-18.4 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
17.3-17.7 FIXED-SATELLITE (Earth-to-space) 5.516 (space-to-Earth) 5.516A 5.516B Radiolocation 5.514	**17.3-17.7** FIXED-SATELLITE (Earth-to-space) MOD 5.484A 5.516 MOD (space-to-Earth) MOD 5.516A MOD 5.517 BROADCASTING-SATELLITE Radiolocation 5.514 5.515	**17.3-17.7** FIXED-SATELLITE (Earth-to-space) 5.516 Radiolocation 5.514

Reasons: Introduce the FSS (space-to-Earth) allocation in the frequency band 17.3-17.7 GHz in Region 2 and apply RR Nos. **5.516A** and **5.517** to this new allocation. Also, new footnotes for application of NGSO satellite systems are introduced.

MOD USA/AI 1.19/2

5.484A The use of the bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.75 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Region 1, 13.75-14.5 GHz (Earth-to-space), 17.3-17.7 GHz (space-to-Earth) in Region 2, 17.8-18.6 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 27.5-28.6 GHz (Earth-to-space), 29.5-30 GHz (Earth-to-space) by a non-geostationary-satellite system in the fixed-satellite service is subject to application of the provisions of No. **9.12** for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-geostationary-satellite systems in the fixed-satellite service and of the complete coordination or notification information, as appropriate, for the geostationary-satellite networks, and No. **5.43A** does not apply. Non-geostationary

satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.

Reasons: Extend No. **9.12** to apply to the frequency band 17.3-17.7 GHz in Region 2

MOD USA/AI 1.19/3

5.516A In the band 17.3-17.7 GHz, earth stations of the fixed-satellite service (space-to-Earth) in Regions 1 and 2 shall not claim protection from the broadcasting-satellite service feeder-link earth stations operating under Appendix **30A**, nor put any limitations or restrictions on the locations of the broadcasting-satellite service feeder-link earth stations anywhere within the service area of the feeder link. (WRC-~~03~~23)

Reasons: Extend the applicability of these footnote to Region 2 and RR Table 22-3 covering the frequency range 17.8-18.4 GHz, could be extended in Region 2, to 17.3-18.4 GHz.

MOD USA/AI 1.19/4

5.517 In Region 2, use of the fixed-satellite (space-to-Earth) service in the band 17.~~7~~3-17.8 GHz shall not cause harmful interference nor claim protection from assignments in the broadcasting-satellite service operating in conformity with the Radio Regulations. (WRC-~~07~~23)

Reasons: Extend the applicability of the frequency ranges in this footnote to Region 2.

MOD USA/AI 1.19/7

ARTICLE 22

Space services1

…

TABLE **22-1B** (WRC-~~03~~23)

Limits to the epfd↓ radiated by non-geostationary-satellite systems in the fixed-satellite service in certain frequency bands3, 6, 8, X

Frequency band (GHz)	**epfd↓ (dB(W/m²))**	**Percentage of time during which epfd↓ may not be exceeded**	**Reference bandwidth (kHz)**	**Reference antenna diameter and reference radiation pattern**7
17.8-18.6	−175.4 −175.4 −172.5 −167 −164 −164	0 90 99 99.714 99.971 100	40	1 m Recommendation ITU-R S.1428-1
	−161.4 −161.4 −158.5 −153 −150 −150	0 90 99 99.714 99.971 100	1 000	
	−178.4 −178.4 −171.4 −170.5 −166 −164 −164	0 99.4 99.9 99.913 99.971 99.977 100	40	2 m Recommendation ITU-R S.1428-1
	−164.4 −164.4 −157.4 −156.5 −152 −150 −150	0 99.4 99.9 99.913 99.971 99.977 100	1 000	

8 **22.5C.7** A non-geostationary-satellite system shall meet the limits of this Table in both the 40 kHz and the 1 MHz reference bandwidths. (WRC-2000)

X 22.5C.X A non-geostationary-satellite system shall meet the limits of this Table for the 17.3-17.7 GHz band with respect to satellite systems in the broadcasting-satellite service utilizing the reference patterns of Recommendation ITU-R BO.1443. (WRC-2023).

Frequency band (GHz)	epfd↓ (dB(W/m²))	Percentage of time during which epfd↓ may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter and reference radiation pattern[7]
	−185.4 −185.4 −180 −180 −172 −164 −164	0 99.8 99.8 99.943 99.943 99.998 100	40	5 m Recommendation ITU-R S.1428-1
	−171.4 −171.4 −166 −166 −158 −150 −150	0 99.8 99.8 99.943 99.943 99.998 100	1 000	

Reasons: Applies epfd↓ limits in order to Protect GSO BSS (space-to-Earth) allocation from NGSO FSS (space-to-Earth) operations.

MOD USA/AI 1.19/8

TABLE **22-3** (WRC-~~2000~~2023)

Limits to the epfd$_{is}$ radiated by non-geostationary-satellite systems in the fixed-satellite service in certain frequency bands[19]

Frequency band (GHz)	epfd$_{is}$ (dB(W/m²))	Percentage of time during which epfd$_{is}$ level may not be exceeded	Reference bandwidth (kHz)	Reference antenna beamwidth and reference radiation pattern[20]
10.7-11.7 (Region 1) 12.5-12.75 (Region 1) 12.7-12.75 (Region 2)	−160	100	40	4° Recommendation ITU-R S.672-4, *Ls* = −20

[19] **22.5F.2** In meeting these limits, the administrations intending to develop such systems shall ensure that the assignments appearing in the feeder-link Plans of Appendix **30A** will be fully protected. (WRC-~~2000~~2023)

[20] **22.5F.3** In this Table, the reference pattern of Recommendation ITU-R S.672-4 shall be used only for the calculation of interference from non-geostationary-satellite systems in the fixed-satellite service into geostationary-satellite systems in the fixed-satellite service. In applying the equations of Annex 1 to Recommendation ITU-R S.672-4, the parabolic main beam equation shall start at zero. (WRC-2000)

17.3-17.7 (space-to-Earth) (Region 2) 17.8-18.4	−160	100	40	4° Recommendation ITU-R S.672-4, *Ls* = −20

Reasons: Applies $epfd_{is}$ limits in order to protect FSS (earth-to-space) feeder links subject to AP30A from NGSO FSS.

MOD USA/AI 1.19/9

APPENDIX 30A (REV.WRC-19)*

Provisions and associated Plans and List[1] for feeder links for the broadcasting-satellite service (11.7-12.5 GHz in Region 1, 12.2-12.7 GHz in Region 2 and 11.7-12.2 GHz in Region 3) in the frequency bands 14.5-14.8 GHz[2] and 17.3-18.1 GHz in Regions 1 and 3, and 17.3-17.8 GHz in Region 2 (WRC-03)

ARTICLE 7 (REV.WRC-~~19~~23)

Coordination, notification and recording in the Master International Frequency Register of frequency assignments to stations in the fixed-satellite service (space-to-Earth) in Region~~s~~ 1 and 2 in the frequency band 17.3-18.1 GHz and in Region~~s 2 and~~ 3 in the frequency band 17.7-18.1 GHz, to stations in the fixed-satellite service (Earth-to-space) in Region 2 in the frequency bands 14.5-14.8 GHz and 17.8-18.1 GHz, to stations in the fixed-satellite service (Earth-to-space) in countries listed in Resolution 163 (WRC-15) in the frequency band 14.5-14.75 GHz and in countries listed in Resolution 164 (WRC-15) in the frequency band 14.5-14.8 GHz where those stations are not for feeder links for the broadcasting-satellite service, and to stations in the broadcasting-satellite service in Region 2 in the frequency band 17.3-17.8 GHz when frequency assignments to feeder links for broadcasting-satellite stations in the frequency bands 14.5-14.8 GHz and 17.3-18.1 GHz in Regions 1 and 3 or in the frequency band 17.3-17.8 GHz in Region 2 are involved[28] (Rev.WRC-~~19~~23)

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* The expression "frequency assignment to a space station", wherever it appears in this Appendix, shall be understood to refer to a frequency assignment associated with a given orbital position. (WRC-03)

1 The Regions 1 and 3 feeder-link List of additional uses is annexed to the Master International Frequency Register (see Resolution **542 (WRC-2000)****). (WRC-03)

** *Note by the Secretariat*: This Resolution was abrogated by WRC-03.

2 This use of the band 14.5-14.8 GHz is reserved for countries outside Europe.

Note by the Secretariat: Reference to an Article with the number in roman is referring to an Article in this Appendix.

28 These provisions do not replace the procedures prescribed in Articles **9** and **11** when stations other than those for feeder links in the broadcasting-satellite service subject to a Plan are involved. (WRC-03)

Section I – Coordination of transmitting space or earth stations in the fixed-satellite service or transmitting space stations in the broadcasting-satellite service with assignments to broadcasting-satellite service feeder links

Reasons: Applies epfd↓ limits in order to Ppotect GSO BSS (space-to-Earth) allocation from NGSO FSS (space-to-Earth) operations.

MOD USA/AI 1.19/10

7.1 The provisions of No. **9.7** and the associated provisions under Articles **9** and **11** are applicable to transmitting space stations in the fixed-satellite service in Regions 1 and 2 in the frequency band 17.3-18.1 GHz, to transmitting space stations in the fixed-satellite service in Regions ~~2 and~~ 3 in the frequency band 17.7-18.1 GHz, to transmitting earth stations in the fixed-satellite service in Region 2 in the frequency bands 14.5-14.8 GHz and 17.8-18.1 GHz, to transmitting earth stations in the fixed-satellite service in countries listed in Resolution **163 (WRC-15)** in the frequency band 14.5-14.75 GHz and in countries listed in Resolution **164 (WRC-15)** in the frequency band 14.5-14.8 GHz where those stations are not for feeder links for the broadcasting-satellite service, and to transmitting space stations in the broadcasting-satellite service in Region 2 in the frequency band 17.3-17.8 GHz. (WRC-~~19~~-23)

Reasons: Extend the applicability of the provisions in RR Appendix **30A**, Article **7,** 7.1, to the FSS (space-to-Earth) in the 17.3-17.7 GHz band in Region 2.

_____

Reasons: Consequential

[29] (SUP – WRC-19)

MOD USA/AI 1.19/11

ANNEX 4 (REV.WRC-19)

Criteria for sharing between services

1 Threshold values for determining when coordination is required between, on one hand, transmitting space stations in the fixed-satellite service or the broadcasting-satellite service and, on the other hand, a receiving space station in the feeder-link Plan or List or a proposed new or modified receiving space station in the List, in the frequency bands 17.3-18.1 GHz (Regions 1 and 3) and in the feeder-link Plan or a proposed modification to the Plan in the frequency band 17.3-17.8 GHz (Region 2) (WRC-03)

With respect to § 7.1, Article 7, coordination of a transmitting geostationary space station in the fixed-satellite service or in the broadcasting-satellite service with a receiving space station in a broadcasting-satellite service feeder link in the Regions 1 and 3 feeder-link Plan or List, or a proposed new or modified receiving space station in the List, or in the Region 2 feeder-link Plan or proposed modification to the Plan is required when the power flux-density arriving at the receiving space station of a broadcasting-satellite service feeder link of another administration would cause an increase in the noise temperature of the feeder-link space station which exceeds a threshold value of $\Delta T_s / T_s$ corresponding to 6%. $\Delta T_s / T_s$ is calculated in accordance with Case II of the method given in Appendix **8**. ~~(WRC-03)~~

In Region 2, with respect to § 7.1, Article 7, a transmitting non-geostationary system in the fixed-satellite service with respect to a receiving space station in the broadcasting-satellite feeder link in the Region 2 feeder-link Plan or proposed modification to the Plan shall meet the equivalent power flux-density limit in table 22-3 of Article 22. (WRC-23)

Reasons: Consequential based on Table 22-3 updates for epfd is to protect AP30A

MOD USA/AI 1.19/11

APPENDIX 5 (REV.WRC-~~19~~23)

….

TABLE 5-1 (*continued*) (Rev.WRC-~~19~~23)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **9.7** GSO/GSO (*cont.*)		2*bis*) 13.4-13.65 GHz (Region 1)	i) Bandwidth overlap, and ii) any network in the space research service (SRS) or any network in the FSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±6° of the nominal orbital position of a proposed network in the FSS or SRS		
		3) 17.7-19.7 GHz, (Regions ~~2 and~~ 3), 17.3-19.7 GHz (Region 1 and 2) and 27.5-29.5 GHz	i) Bandwidth overlap, and ii) any network in the FSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the FSS		
		3*bis*) 19.7-20.2 GHz and 29.5-30 GHz	i) Bandwidth overlap, and ii) any network in the FSS or in the mobile-satellite service (MSS) and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the FSS or in the MSS.		

Reasons: Consequential, Covers the coordination of two GSO networks of the FSS (except earth stations operating in opposite directions of transmission) under No. **9.7**.

SUP USA/AI 1.19/12

RESOLUTION 174 (WRC 19)

Primary allocation to the fixed-satellite service in the space-to-Earth direction in the frequency band 17.3-17.7 GHz in

WAC-23/62 (08.31.2022)

UNITED STATES OF AMERICA

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 10

10 to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention,

Draft Proposal for a WRC-27 Agenda Item

Spectrum allocation and associated regulatory provisions to support use of the 51.4-52.4 GHz fixed-satellite service (Earth-to-space) frequency band for gateway earth stations operating with non-geostationary-satellite orbit FSS systems

Background:

Today, non-geostationary orbit (non-GSO) satellite systems provide a wide range of broadband services in the fixed-satellite service (FSS) to a rapidly growing customer base, with more systems to come. Advances in satellite technologies are allowing a variety of new services including innovative broadband, video and mobile services covering all corners of the globe and providing service to places and regions not covered by traditional terrestrial services and that, accordingly, are missing out on the benefits of new and innovative telecommunications services. In addition to adding broadband connectivity, non-GSO FSS systems also support a number of important public interest initiatives including tele-health, tele-education and public protection and disaster relief.

The technological progress in radio communication enables the satellite industry to offer much more capacity today with much less spectrum. This applies to the fixed-satellite service whether operating in the geostationary or non-geostationary orbits. The satellite industry takes this development into account by using the most spectrum efficient technologies, including advances in spot-beam technologies and frequency re-use. In addition, for some satellite applications, such as gateways, sharing with other radiocommunication services could be more easily accomplished. However, even with this efficiency, demand for fixed-satellite service outpaces the spectrum available for this service today.

There is growing demand for fixed-satellite service, including broadband and data services which in many rural and remote locations are the only ways of receiving these important communication services. Therefore, non-gSO satellite operators are seeking access to additional FSS spectrum to satisfy requirements for existing and new services, including broadband services.

The need for additional FSS spectrum in the 50 GHz range for non-GSO FSS gateway uplinks was established in response to agenda item 9.1.9 for WRC-19 in Report ITU-R S.2461. These studies included the need for spectrum for both non-GSO and GSO FSS networks. The spectrum needs for GSO were successfully addressed by adopting an allocation at WRC-19 to GSO use of the frequency band 51.4-52.4 GHz. This proposal considers expanding the use of the FSS (Earth-to-space) frequency band 51.4-52.4 GHz to address the spectrum needs of non-GSO FSS networks in accordance with the spectrum needs identified in Report ITU-R S.2461. Other services, including GSO FSS gateway uplinks, will be taken into account in the studies, and the analysis will consider the possibility of sharing with existing uses of the band.

The specific proposals for this WRC-27 agenda item are provided below:

Proposals

SUP USA/10 (51.4-52.4 GHz NGSO FSS)/1

RESOLUTION 812 (WRC-19)

Preliminary agenda for the 2027 World Radiocommunication Conference

Reasons: This Resolution must be suppressed, as WRC-23 will create a new Resolution that will include the agenda for WRC-27.

ADD USA/10 (51.4-52.4 GHz NGSO FSS)/2

RESOLUTION [A10] (WRC-23)

Agenda for the 2027 World Radiocommunication Conference

The World Radiocommunication Conference (Dubai, 2023),

considering

a) that, in accordance with No. 118 of the ITU Convention, the general scope of the agenda for a world radiocommunication conference (WRC) should be established four to six years in advance and that a final agenda shall be established by the ITU Council two years before the conference;

b) Article 13 of the ITU Constitution relating to the competence and scheduling of WRCs and Article 7 of the Convention relating to their agendas;

c) the relevant resolutions and recommendations of previous world administrative radio conferences (WARCs) and WRCs,

recognizing

a) that this conference has identified a number of urgent issues requiring further examination by WRC-27;

b) that, in preparing this agenda, some items proposed by administrations could not be included and have had to be deferred to future conference agendas,

resolves

to recommend to the Council that a WRC be held in 2027 for a maximum period of four weeks, with the following agenda:

1 on the basis of proposals from administrations, taking account of the results of WRC-19 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the frequency bands under consideration, to consider and take appropriate action in respect of the following items:

1.x to consider the use of the 51.4 – 52.4 GHz band by gateway earth stations transmitting to non-geostationary satellite orbit systems operating in the, fixed-satellite service (FSS) (Earth-to-space) in accordance with Resolution **[AI10_51.4-52.4 Non-GSO FSS] (WRC-23);**

. . .

invites the ITU Council
to finalize the agenda and arrange for the convening of WRC-27, and to initiate as soon as possible the necessary consultations with Member States,

instructs the Director of the Radiocommunication Bureau
1 to make the necessary arrangements to convene meetings of the Conference Preparatory Meeting (CPM) and to prepare a report to WRC-27;
2 to submit a draft report on any difficulties or inconsistencies encountered in the application of the Radio Regulations referred in agenda item 9.2 to the second session of the CPM and to submit the final report at least five months before the next WRC,

instructs the Secretary-General
to communicate this Resolution to international and regional organizations concerned.

Reasons: To provide for studies in the 51.4-52.4 GHz frequency band for gateway earth stations of non-GSO FSS in the Earth-to-space direction on a primary basis.

ADD USA/10 (51.4-52.4 GHz NGSO FSS)/3

RESOLUTION [AI10_51.4-52.4 NON-GSO FSS] (WRC-23)

Studies relating to the use of the 51.4 – 52.4 GHz band by gateway earth stations transmitting to non-geostationary FSS satellite orbit systems (Earth-to-space)

The World Radiocommunication Conference (Dubai, 2023),

considering
a) that satellite systems are increasingly being used to deliver broadband services and can help enable broadband access;
b) that next-generation FSS technologies for broadband will increase speeds, with faster rates expected in the near future;
c) that technological developments such as advances in spot-beam technologies and frequency reuse are used by the FSS in spectrum above 30 GHz to increase the efficient use of spectrum;

recognizing
a) the need to protect existing services when considering frequency bands for possible additional allocations to any service;
b) that the frequency band 51.4-52.4 GHz is allocated to fixed and mobile services, which will need to be protected, and is available for high-density applications in the fixed service as indicated in No. **5.547**;
d) that Report ITU-R S.2461includes studies on the spectrum needs for additional FSS spectrum in the Earth-to-space direction for both geostationary-satellite orbit (GSO) FSS networks and non-GSO FSS systems in the frequency band 51.4-52.4 GHz;
e) that WRC-19, pursuant to Resolution **162 (WRC-15),** allocated the frequency band 51.4-52.4 GHz to the FSS (Earth-to-space) on a primary basis, and also adopted No. **5.555C** which limited the use of the FSS allocation to geostationary satellite networks;
g) that the need for additional uplink spectrum in the 50 GHz range for non-GSO FSS gateway use continues,

resolves to invite ITU-R
to conduct, and complete in time for WRC-27:
1 sharing and compatibility studies with current and planned stations of existing primary services, , including in adjacent bands as appropriate, including protection of fixed and mobile services, to determine the suitability of revising the primary allocation to the FSS in the frequency band 51.4-52.4 GHz to enable use by gateway earth stations of non-GSO FSS systems (Earth-to-space);
2 compatibility studies between NGSO FSS (E-s) gateway stations and systems operating in the passive frequency band 52.6-54.25 GHz;
4 studies regarding the protection of GSO FSS networks and associated gateway earth stations from the emissions of non-GSO FSS systems and associated gateways,

instructs the Director of the Radiocommunication Bureau
to report on the results of the ITU-R studies to WRC-27,

invites administrations
to participate actively in these studies by submitting contributions to ITU-R.

Reasons: To conduct studies on the possibility of revising the allocation to the FSS (Earth-to-space) in the frequency band 51.4-52.4 GHz, and associated regulatory provisions, to enable use by non-GSO FSS gateway stations on a primary basis.

ATTACHMENT

PROPOSAL FOR FUTURE AGENDA ITEM FOR [XXX]

Subject: Proposed Future WRC Agenda Item for WRC-2027 to consider, based on the results of ITU-R studies, revisions to the allocation to the fixed-satellite service (Earth-to-space) in the 51.4-52.4 GHz band, and associated regulatory provisions, to enable use by non-geostationary satellite orbit (non-GSO) FSS gateway earth stations with a minimum antenna diameter of 2.4 meters in accordance with Resolution **[AI10_51.4-52.4 Non-GSO FSS] (WRC-23).**
Origin: United States of America

Proposal: to conduct studies with a view to removing the limitation in No. **5.555C** of the Radio Regulations to geostationary-satellite orbit (GSO) FSS networks to meet established non-GSO FSS spectrum needs in accordance with Resolution **[AI10_51.4-52.4 Non-GSO FSS] (WRC-23).**

Background/reason:
To expand the availability of FSS gateway uplink spectrum in the 50 GHz range to meet documented requirements of non-GSO FSS systems.

Radiocommunication services concerned:
Fixed-satellite service, fixed service, mobile service, Earth exploration satellite service, radio astronomy service

Indication of possible difficulties: None foreseen

Previous/ongoing studies on the issue: Studies on spectrum needs for non-GSO FSS systems in this frequency range were conducted for WRC-19 and included in Report ITU-R S.2461; sharing/compatibility studies not including non-GSO FSS systems in this frequency range are included in Report ITU-R S.2463.

Studies to be carried out by: ITU-R Study Group 4	*with the participation of:* SGs 5 and 7

ITU-R Study Groups concerned: SG 4, SG 5, and SG 7

ITU resource implications, including financial implications (refer to CV126): Minimal

Common regional proposal: Yes/No ***Multicountry proposal:*** Yes/No
Number of countries:

Remarks

WAC-23/063 (08.31.2022)

UNITED STATES OF AMERICA

DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

AGENDA ITEM 7: *to consider possible changes, and other options, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC-07)**, in order to facilitate rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary satellite orbit;*
Resolution **86 (Rev.WRC-07)** – *Implementation of Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference*

*Editor's Note: This document presents the comments of IWG-4/WAC-23 on the NTIA proposal for Agenda Item 7, Topic D[1] in Doc. **IWG-4/026**. However, the revisions in this document are against a baseline that is the draft IAP for AI 7, Topic D1 in Doc. **CITEL/GT/CMR-23/doc. 038/22 rev.1**, with changes incorporated from the NTIA proposal in Doc. **IWG-4/026**.*

Topic D1 - *Modifications to Appendix 1 to Annex 4 of RR Appendix **30B***

BACKGROUND INFORMATION:

Appendix 1 to Annex 4 of Appendix **30B** of the Radio Regulations deals with the method to determine the overall single-entry and aggregate carrier-to-interference (*C/I*) value averaged over the necessary bandwidth of the modulated carrier.

The World Radiocommunication Conference (WRC) 2019 adopted modifications to sections 1.1 and 1.2 of Annex 4 of RR Appendix **30B** by amending the minimum orbital separation between GSO satellite networks to be exceeded in order to be considered as unaffected and not be identified by the Bureau when performing its examination under § 6.5 of RR Appendix **30B**. The minimum orbital separations were changed from 10° and 9° to 7° and 6°, in §§ 1.1 and 1.2 of Annex 4 of RR Appendix **30B**, respectively~~replacing 10 and 9 degrees as the minimum orbital separation by 7 and 6 degrees, respectively~~. However, these modifications were not reflected in section 2 of Appendix 1 to Annex 4 of RR Appendix **30B** where 10 and 9 degrees are still referred to for the calculation of the aggregate *C/I* ratio at any given downlink test point.

WRC-23 agenda item 7, Topic D1, considers this discrepancy and proposes to align Appendix 1 to Annex 4 of RR Appendix **30B** with the values of orbital separation in §§ 1.1 and 1.2 of Annex 4 of RR Appendix **30B**. With these modifications, the method proposed in Appendix 1 to Annex 4 of RR Appendix **30B** will ~~a method has been developed, which is to modify section 2 of Appendix 1 to Annex 4 of RR Appendix **30B** to~~ align the values of orbital separation with those in sections 1.1 and 1.2 of the Annex adopted by WRC-19.

Proposal:

MOD USA/7D(1)/1

APPENDIX 30B (REV.WRC-2319)

Provisions and associated Plan for the fixed-satellite service in the frequency bands 4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz

ANNEX 4 (REV.WRC-1923)

Criteria for determining whether an allotment or an assignment is considered to be affected[15*bis*]

APPENDIX 1 TO ANNEX 4 (REV.WRC-0723)

Method for determination of the overall single-entry and aggregate carrier-to-interference value averaged over the necessary bandwidth of the modulated carrier

II. 2 AGGREGATE *C/I*

The aggregate $(C/I)_{agg}$ at a given downlink test point is given by:

$$(C/I)_{agg} = -10 \log_{10}\left(\sum_{j}^{n} 10^{-\frac{(C/I)_{t_j}}{10}}\right) \quad \text{dB}$$

$$j = 1, 2, 3 \ldots n,$$

where:

$(C/I)_{tj}$: overall carrier-to-interference ratio due to interference from the j-th allotment or assignment calculated using the method for overall single-entry $(C/I)_t$ as provided in § 1 of Appendix **1** to this Annex; and

n: total number of interfering allotments or assignments for which the orbital separation with the desired satellite is less than or equal to 710° in the case of the 6/4 GHz band and less than or equal to 69° in the case of the 13/10-11 GHz band.

Reasons: toTo align Appendix 1 to Annex 4 of RR Appendix **30B** with the orbital spacing values contained in §§ 1.1 and 1.2 of Annex 4 to Appendix **30B** (Rev. WRC-19) and incorporate the Rule of Procedure on Section 2 of Appendix 1 to Annex 4 in the RR.

_____

[15*bis*] For frequency assignments recorded in the List and brought into use before 23 November 2019, the criteria of § 2.2 of this Annex are not applicable. (WRC-19)

WAC-23/064 (08.31.2022)

UNITED STATES OF AMERICA

DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda Item 4: *in accordance with Resolution **95 (Rev.WRC-19)**, to review the Resolutions and Recommendations of previous conferences with a view to their possible revision, replacement or abrogation;*

Background: Resolution **655 (WRC-15)** tasked the ITU-R with studies and other work items related to the definition of time scale and dissemination of time scale via radiocommunication systems. This included strengthening the cooperation between ITU-R and BIPM, the International Committee for Weights and Measures (CIPM), CGPM, as well as other relevant organizations, and to carry out a dialogue concerning the expertise of each organization, to further and more widely study the various aspects of current and potential future reference time scales, including their impacts and applications, to provide advice on the content and structure of time signals to be disseminated by radiocommunication systems, using the combined expertise of the relevant organizations, and to prepare one or more reports containing the results of studies that should include one or more proposals to determine the reference time scale and address other issues mentioned previously.

This work, as originally proposed in Resolution **655 (WRC-15)**, is complete. The United States proposes changes to this Resolution to reflect the completion of the work items as well as to acknowledge the ongoing cooperation between the ITU and other relevant organizations in the various aspects of current and potential future reference time scales and the role of the ITU-R in the dissemination of the international reference time scale by radiocommunication. ~~The United States also proposes adding CGPM Resolution 2 (2018) as an annex to Resolution **655 (WRC-15)**. This resolution of the CGPM is the basis for the roles of the ITU and other relevant organizations, under the memorandum of understanding between the ITU and the BIPM, in the definition of and dissemination of the international reference time scale. It is provided in an annex for reference.~~

Proposals:

MOD USA/4293A21/1

RESOLUTION 655 (Rev.WRC-23~~15~~)

Definition of time scale and dissemination of time signals via radiocommunication systems

The World Radiocommunication Conference (Dubai~~Geneva~~, 2023~~15~~),

considering

a) that the ITU Radiocommunication Sector (ITU-R) is responsible for providing advice on the content and structure of time signals to be disseminated via radiocommunication systems, including ~~the dissemination of time signals via radiocommunication~~ for ~~defining~~ the standard frequency and time signal service and the standard frequency and time signal-satellite service ~~for the dissemination of time signals via radiocommunication~~;

b) that the International Bureau of Weights and Measures (BIPM) is responsible for establishing and maintaining the second of the International System of Units (SI) and its dissemination through the reference time scale;
c) that the definition of reference time scale and dissemination of time signals via radiocommunication systems are important for applications and equipment that require a time traceable to the reference time,

considering further
a) that ITU-R is an organization member of the Consultative Committee for Time and Frequency (CCTF) and participates in the General Conference on Weights and Measures (CGPM) as an observer;
b) that BIPM is a Sector Member of ITU-R and participates in the relevant activities of ITU-R,

noting
a) that the international reference time scale is the legal basis for time-keeping for many countries, and *de facto* is the time scale used in the majority of countries;
b) that disseminated time signals are used not only in telecommunications but also in many industries and practically all areas of human activities;
c) that time signals are disseminated by both wired communications covered by Recommendations of the ITU Telecommunication Standardization Sector (ITU-T) and by systems of different radiocommunication services (space and terrestrial), including the standard frequency and time signal service for which ITU-R is responsible,

recognizing
a) that No. **26.1** states that: "Attention should be given to the extension of this service to those areas of the world not adequately served";
b) that No. **26.6** states that: "In selecting the technical characteristics of standard frequency and time signal transmissions, administrations shall be guided by the relevant ITU-R Recommendations";

c) that the ~~current~~ original definition of the international reference time scale UTC resulted from work completed in 1970 by the International Radio Consultative Committee (CCIR) of the ITU, in full cooperation with the CGPM;
d) that the ITU World Administrative Radio Conference 1979 (WARC-79) included UTC in the Radio Regulations, and since then UTC, as "strongly endorsed" in Resolution 5 of CGPM (1975), has been used as the main time scale for telecommunication networks (wired and wireless) and for other time-related applications and equipment;
e) that the ITU and the BIPM entered into a memorandum of understanding[13] recognizing the respective responsibilities of the relevant unions and organizations towards the dissemination of the international reference time scale via telecommunication;
f) that ~~and~~ the definition of the international reference time scale~~, as~~ is described in CGPM Resolution 2 (2018) ~~in the Annex of this Resolution~~,

resolves ~~*to invite the ITU Radiocommunication Sector*~~
1 to continue ~~strengthen~~ the cooperation between the ITU~~-R~~ and the BIPM, the International Committee for Weights and Measures (CIPM), CGPM, as well as other relevant organizations, and to carry out a dialogue concerning the various aspects of current and potential future reference time scales, including their impacts and applications, according to the expertise of each organization;
~~2 to further and more widely study in cooperation with the relevant international organizations, concerned industries and user groups, through the participation of the membership, the various aspects of current and potential future reference time scales, including their impacts and applications;~~

[13] The Memorandum of Understanding between the BIPM and ITU was signed by the President of the CIPM and the Director BR of the ITU in 2020

23 to provide advice on the content and structure of time signals to be disseminated by radiocommunication systems, using the combined expertise of the relevant organizations, as described in the relevant ITU-R Recommendations,;

4 to prepare one or more reports containing the results of studies that should include one or more proposals to determine the reference time scale and address other issues mentioned in 1, 2 and 3 above,

resolves

that until WRC-23, UTC as described in Recommendation ITU-R TF.460-6 shall continue to apply, and for most practical purposes associated with the Radio Regulations, UTC is equivalent to mean solar time at the prime meridian (0° longitude), formerly expressed in GMT,

instructs the Director of the Radiocommunication Bureau

1 to invite the relevant international organizations such as the International Maritime Organization (IMO), the International Civil Aviation Organization (ICAO), CGPM, CIPM, BIPM, the International Earth Rotation and Reference Systems Service (IERS), the International Union of Geodesy and Geophysics (IUGG), the International Union of Radio Science (URSI), the International Organization for Standardization (ISO), the World Meteorological Organization (WMO) and the International Astronomical Union (IAU) to participate in the work mentioned in *resolves to invite the ITU Radiocommunication Sector*;

2 to report on the progress of this Resolution to WRC-23,

invites the Director of the Telecommunication Development Bureau

to assist the participation of developing countries in meetings, within approved budgetary resources,

invites administrations

to participate in the studies by submitting contributions to ITU-R,

instructs the Secretary-General

to bring this Resolution to the attention of IMO, ICAO, CGPM, CIPM, BIPM, IERS, IUGG, URSI, ISO, WMO and IAU.

Reasons: The work originally proposed in Resolution **655 (WRC-2315)** is complete. The resolves have been modified to emphasize the continuing cooperation between the ITU and other relevant organizations in the various aspects of current and potential future reference time scales and the role of the ITU-R in the dissemination of the international reference time scale by radiocommunication.

ADD USA/4293A21/2

ANNEX TO RESOLUTION 655 (Rev.WRC-23)

CGPM Resolution 2 (2018)

On the definition of time scales

The General Conference on Weights and Measures (CGPM), at its 26th meeting,

considering that

Resolution 1 adopted by the CGPM at its 14th meeting (1971) requested the CIPM to define International Atomic Time (TAI),

no complete self-contained definition of TAI has been provided officially by the CIPM,

the Consultative Committee for the Definition of the Second (CCDS) proposed in its Recommendation S2 (1970) a definition which was extended by a Declaration of the CCDS in 1980,

~~the CGPM at its 15th meeting (1975) noted that Coordinated Universal Time (UTC), derived from TAI, provides the basis of civil time, and strongly endorsed this usage,~~

~~**recognizing** that~~

~~the mission of the BIPM is to ensure and promote the global comparability of measurements, including the provision of a coherent international system of units,~~

~~the International Astronomical Union (IAU) and the International Union of Geodesy and Geophysics (IUGG) with the International Association of Geodesy (IAG) are responsible for defining reference systems for Earth and space applications,~~

~~the International Telecommunication Union Radiocommunication Sector (ITU-R) is responsible for coordinating the dissemination of time and frequency signals and making relevant recommendations,~~

~~the International Earth Rotation and Reference Systems Service (IERS), a service of the IAU and IUGG, is responsible for providing information required to relate terrestrial and celestial reference systems, including time-varying measurements of the Earth's rotation angle, UT1 – UTC, the low-precision prediction of UT1 – UTC for time signal broadcasts, DUT1, and for deciding and announcing leap second insertions,~~

~~**noting** that~~

~~Resolution A4 (1991) of the IAU defined, in Recommendations I and II, the Geocentric Reference System as a system of space-time coordinates for the Earth within the framework of general relativity, and, in Recommendation III, named the time coordinate of that reference system "Geocentric Coordinate Time" (TCG),~~

~~Resolution A4 (1991) of the IAU further defined, in Recommendation IV, Terrestrial Time (TT) as another time coordinate in the Geocentric Reference System, differing from TCG by a constant rate; the unit of measurement of TT being chosen to agree with the SI second on the geoid,~~

~~Resolution B1.9 (2000) of the IAU redefined TT to be a time scale differing from TCG by a constant rate: $d\mathrm{TT}/d\mathrm{TCG} = 1 - L_G$, where $L_G = 6.969290134 \times 10^{-10}$ is a defining constant (the numerical value of L_G was chosen to conform to the value $W_0 = 62636856.0\ \mathrm{m^2 s^{-2}}$ for the gravity potential on the geoid as recommended by Special Commission 3 of the IAG in 1999),~~

~~the redefinition of TT in 2000 introduced an ambiguity between TT and TAI as the CCDS had stated in 1980 that TAI was to have "*the SI second as realized on the rotating geoid as the scale unit*" while the definition of TT does not refer to the geoid,~~

~~**states** that~~

~~TAI is a continuous time scale produced by the BIPM based on the best realizations of the SI second, and is a realization of TT as defined by IAU Resolution B1.9 (2000),~~

~~in the transformation from the proper time of a clock to TAI, the relativistic rate shift is computed with respect to the conventionally adopted equipotential $W_0 = 62636856.0\ \mathrm{m^2 s^{-2}}$ of the Earth's gravity potential, which conforms to the constant L_G defining the rate of TT,~~

~~as stated in the IAU Resolution A4 (1991), TT – TAI = 32.184 s exactly at 1 January 1977, 0h TAI at the geocentre, in order to ensure continuity of TT with Ephemeris Time,~~

~~UTC produced by the BIPM, based on TAI, is the only recommended time scale for international reference and the basis of civil time in most countries,~~

~~UTC differs from TAI only by an integral number of seconds as published by the BIPM,~~

~~users can derive the rotation angle of the Earth by applying to UTC the observed or predicted values of UT1 – UTC, as provided by the IERS,~~

– UTC provides a means to measure time intervals and to disseminate the standard of frequency during intervals in which leap seconds do not occur,

– traceability to UTC is obtained through local real-time realizations "UTC(*k*)" maintained by laboratories contributing data to the calculation of UTC, identified by "*k*",

confirms that

1 International Atomic Time (TAI) is a continuous time scale produced by the BIPM based on the best realizations of the SI second. TAI is a realization of Terrestrial Time (TT) with the same rate as that of TT, as defined by the IAU Resolution B1.9 (2000),

2 Coordinated Universal Time (UTC) is a time scale produced by the BIPM with the same rate as TAI, but differing from TAI only by an integral number of seconds,

and **recommends** that

– all relevant unions and organizations consider these definitions and work together to develop a common understanding on reference time scales, their realization and dissemination with a view to consider the present limitation on the maximum magnitude of UT1 - UTC so as to meet the needs of the current and future user communities,

– all relevant unions and organizations work together to improve further the accuracy of the prediction of UT1 - UTC and the method for its dissemination to satisfy the future requirements of users.

Reasons: This resolution of the CGPM is the basis for the roles of the ITU and other relevant organizations, under the memorandum of understanding between the ITU and the BIPM, in the definition of and dissemination of the international reference time scale. It is provided in this annex for reference.